

TOWARD SUSTAINABLE URBAN FOREST GOVERNANCE: STRATEGIES FOR
STAKEHOLDER ENGAGEMENT IN TREE PLANTING AND STEWARDSHIP

A Thesis

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ABSTRACT

Cities across the United States are planting thousands, if not millions, of trees to remediate the negative environmental impacts of urbanization and to enhance the livability of urban areas. Engaging residents, property owners and other stakeholders in urban forest management can ensure that newly planted trees become established so that the benefits provided by the trees can be sustained in the long-term. Urban forestry practitioners working in the government and civil society sector play an important role in providing opportunities for stakeholders to participate in the planning, planting and maintenance of urban trees. My thesis utilizes mixed methods research to examine the stakeholder engagement approaches of urban forestry practitioners, residents' perceptions of their shared role with government and civil society to maintain urban trees, as well as the institutional, physical and social factors within the urban environment that may influence urban forest stewardship behaviors.

BIOGRAPHICAL SKETCH

Christine Moskell was raised in Newburyport, Massachusetts. Growing up on the Atlantic Coast, she spent countless hours with family and friends at the beach and at the Artichoke, a reservoir near her home that is part of the Merrimack River watershed. Christine credits the time she spent in these natural areas with shaping her interest in environmental conservation. As a senior in high school, Christine completed an internship at the Parker River National Wildlife Refuge on Plum Island, a barrier island on the north shore of Boston. Although she enjoyed learning about wildlife management as part of her internship, Christine realized she was more interested in environmental education and the human dimensions of environmental issues. This interest led her to attend Hobart and William Smith Colleges in Geneva, New York where she majored in environmental studies and minored in economics. In 2006, Christine spent the summer traveling in the Lake Baikal region of Siberia and spent the fall semester studying in Australia and New Zealand. In her senior year, Christine completed an honors project about the local foods movement and was an environmental education intern at the Finger Lakes Institute. She graduated *cum laude* in May 2008.

After graduating from college, Christine worked as natural resources community educator for Cornell University Cooperative Extension of Onondaga County in Syracuse, New York. In her position, she supervised adults and youth on numerous stewardship projects in the eastern Finger Lakes and waterways of Central New York, including rain barrel design and construction, urban tree plantings, rain garden installation and invasive aquatic species removals. Christine entered the Department of Natural Resources at Cornell University in Fall 2009 and completed her Master's Degree in 2012. She will continue in the PhD program in the Department of Natural Resources at Cornell University.

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TABLE OF CONTENTS

| | |
|--|-----|
| ABSTRACT | i |
| BIOGRAPHICAL SKETCH | iii |
| ACKNOWLEDGMENTS | iv |
| CHAPTER ONE: INTRODUCTION | 1 |
| Thesis Objectives | 3 |
| REFERENCES | 6 |
| CHAPTER TWO: AN EXAMINATION OF THE PRACTICE OF STAKEHOLDER ENGAGEMENT IN URBAN FORESTRY | 1 |
| Abstract | 1 |
| Introduction | 2 |
| Outcomes of Stakeholder Engagement in Urban Forestry | 5 |
| Stakeholder Engagement Methods in Urban Forestry | 6 |
| Challenges for Engagement | 23 |
| The Present Study | 25 |
| Methods | 25 |
| Results | 27 |
| Discussion | 53 |
| Conclusion | 60 |
| REFERENCES | 63 |
| CHAPTER THREE: RESIDENTS' BELIEFS TOWARD URBAN FOREST GOVERNANCE IN NEW YORK CITY | 68 |
| Abstract | 68 |
| Introduction | 70 |
| Literature Review | 73 |
| Methods | 92 |
| Results | 101 |
| Discussion | 116 |
| Conclusions and Limitations | 126 |
| REFERENCES | 127 |
| CHAPTER FOUR: INTEGRATING HUMAN AND NATURAL SYSTEMS IN COMMUNITY PSYCHOLOGY: AN ECOLOGICAL MODEL OF STEWARDSHIP BEHAVIOR | 134 |
| Abstract | 134 |
| Introduction | 135 |
| Towards a Stronger Link between Humans and the Natural Environment in CP .. | 137 |
| Urban Forestry and Urban Tree Planting | 141 |
| Proposed Ecological Model of Stewardship | 142 |
| Implications for Multi-level Ecological Interventions | 159 |
| Conclusions and Future Research | 161 |

| | |
|--|-----|
| CHAPTER FIVE: DISCUSSION..... | 171 |
| Summary of Methods..... | 171 |
| Discussion of Key Findings..... | 171 |
| Implications and Tensions for Urban Forest Management..... | 175 |
| Personal Reflection..... | 180 |
| Conclusion | 185 |
| REFERENCES | 187 |
| APPENDICES | 189 |
| Appendix A: Interview Guide with Urban Forestry Practitioners..... | 189 |
| Appendix B: Survey of Residents in Canarsie and Jamaica, NYC..... | 190 |

LIST OF FIGURES

Figure 2.1: Conceptual model for urban forestry practitioner interviews study

Figure 3.1: Conceptual model for urban forest governance study

Figure 4.1: Community psychology ecological model including the natural environment

Figure 4.2: Basic outline of ecological model of urban forest stewardship

Figure 4.3: Proposed ecological model of urban forest stewardship.

LIST OF TABLES

| |
|---|
| Table 2.1: Methods for instrumental stakeholder analysis |
| Table 2.2 Methods for normative stakeholder analysis |
| Table 2.3: Methods in communication for stakeholder engagement |
| Table 2.4: Methods for educational programs in urban forestry |
| Table 2.5: Methods for empowering processes within urban forestry organizations |
| Table 2.6: Challenges of stakeholder engagement in urban forestry |
| Table 2.7: Type of organization and geographic location of urban forestry practitioners |
| Table 2.8: Interview results for sub-theme “stakeholder analysis” |
| Table 2.9: Interview results for sub-theme “communication” |
| Table 3.1: Results of previous research on benefits and annoyances of urban trees |
| Table 3.2: Site selection criteria |
| Table 3.3: Demographics of residents’ survey sample compared to 2010 sample |
| Table 3.4: Reported benefits of tree in Canarsie and Jamaica |
| Table 3.5: Reported problems caused by trees in Canarsie and Jamaica |
| Table 3.6: Beliefs about urban forest governance in Canarsie and Jamaica |
| Table 3.7: Logistic regression results for government responsibility in Canarsie |
| Table 3.8: Logistic regression results for government responsibility in Jamaica |
| Table 3.9: Logistic regression results for civil society responsibility in Canarsie |
| Table 3.10: Logistic regression results for shared responsibility in Jamaica |
| Table 3.11: Summary of logistic regression results for beliefs toward governance |
| Table 4.1: Description of environments in the ecological model of stewardship |
| Table 4.2: Description of three domains of urban forest stewardship behavior |

Table 4.3: Behavior settings in the ecological model of urban forest stewardship

CHAPTER ONE: INTRODUCTION

Urban forestry is defined as the management of trees and forest resources in urban community ecosystems for the environmental and human health benefits trees provide (Helms 1998). In light of growing populations and the challenges of environmental issues such as global climate change (Grimm et al. 2008), cities are making substantial investments in their urban forests and other forms of green infrastructure to enhance the livability and sustainability of urban areas. Cities across the United States, including New York, Los Angeles, Sacramento, Denver, Houston, and Sacramento are planting one million trees or more over the next few decades (Young 2011). Many of these initiatives are public-private partnerships between municipal departments and agencies and non-profit organizations (Pincetl 2010). For example, New York City and its non-profit partner the New York Restoration Project has planted nearly 500,000 trees as part of the Million Trees NYC (MTNYC) initiative. The MTNYC initiative plans to plant 1 million trees across all five-city boroughs by 2017 and to create 2,000 acres of new forest by 2030. MTNYC is part of the “PlaNYC” campaign launched by New York City Mayor Michael Bloomberg in 2007. PlaNYC is a 30-year plan encompassing 127 sustainability initiatives related to land use, water quality, transportation, energy, air quality and climate change (City of New York 2007).

Planting thousands or millions of trees in cities is an urban planning decision that aims to increase people’s access to trees and to the health benefits they provide (Wells et al. 2010). There are a wide range of mental and physical health benefits associated with visual and physical access to trees, including reduced feelings of aggression (Kuo and Sullivan 2001) and increased attention span in adults (Tenessen and Cimprich 1995) and children (Faber-Taylor and Kuo 2009). Urban green spaces can also produce community level outcomes. Well-maintained

vegetation in outdoor common spaces in urban residential areas is associated with increased social interactions and strengthened social ties (Kuo et al. 1998) among residents. Urban trees also produce valuable ecological services, such as improved air and water quality and reduced urban air temperatures (see McPherson 2006). However, the capacity for the urban forest to provide these benefits is dependent upon the establishment and long-term survival of the trees (Pincetl 2010). Unfortunately, tree planting programs often do not include funds for post-planting maintenance of the trees, so urban forest managers are heavily relying upon stakeholders, such as residents and property owners, to help provide basic care to trees planted on public property, such as along the sidewalks and street medians and in the natural areas of urban parks (Lu et al. 2010; Svendsen and Campbell 2008).

Urban forestry practitioners who work in local government agencies and non-profit organizations play an important role in engaging stakeholders in urban forest management. The practitioners can educate stakeholders about the benefits of urban trees, as well as provide skills trainings and volunteer experiences for people to learn how to plant and care for trees in their neighborhood (Austin 2002; Johnston and Shimada 2004). For example, the non-profit organization, TreesNY, has been mobilizing and training volunteers in tree stewardship projects as part of its “Citizen Pruner” program for more than three decades in New York City (TreesNY 2010). Similar models exist around the country, such as the Friends of Trees organization in Portland, Oregon (Friends of Trees 2010) and Friends of the Urban Forest organization in San Francisco, California (Friends of the Urban Forest 2010). Some municipalities also offer stakeholders the opportunity to become trained in tree identification and to assist city arborists in conducting street-tree inventories (Bloniarz and Ryan 1996).

Many ‘million-tree’ programs are offering volunteer tree planting days and stewardship

skills trainings to the public. People who are involved in community tree planting projects have been shown to have a sense of ownership over the trees (Sklar and Ames 1985), and to have a higher level of satisfaction for the trees than people who were not involved (Sommer et al. 1994). Researchers have hypothesized that long term participation in collective tree planting activities can produce community development outcomes, such as the formation of proactive citizen groups (Bloniarz and Ryan 1996; Summit and Sommer 1998; Dwyer et al. 2000; Westphal 2003) and neighborhood collective efficacy (Elmendorf 2008). Collective acts of tree planting and stewardship have also been shown to help communities to boost morale and recover from disasters, such as Hurricane Katrina and September 11 (Tidball et al. 2010; Svendsen and Campbell 2010). Additionally, recent research has demonstrated that citizen stewardship efforts can significantly reduce the mortality rate of young street trees (Lu et al. 2010; Boyce 2010). Thus, the success of ‘million-tree’ programs will depend upon stakeholder involvement in urban forestry, and especially in the stewardship of newly planted trees.

Thesis Objectives

The goal of this thesis is to examine strategies for stakeholder engagement in urban tree planting and stewardship. My thesis examines the factors that influence engagement in urban forestry using three different theoretical frameworks. In Chapter 2, I devised a theoretical framework of stakeholder engagement based on four engagement approaches (stakeholder analysis, communication, education and empowerment) that have been widely discussed and researched in the field of urban forestry. To better understand these stakeholder engagement approaches and how urban forestry organizations engage stakeholders in tree planting and stewardship, I conducted 21 semi-structured interviews with urban forestry practitioners.

Findings reveal how urban forestry practitioners use stakeholder analysis, communication, education and empowerment to enable stakeholders to become actively involved in urban forest management. This manuscript is being prepared for submission to *Urban Forestry and Urban Greening*.

In Chapter 3, I examine stakeholder engagement in urban forestry through the lens of governance. Governance is defined as an arrangement of multiple actors outside of government that are given greater authority to govern, or to carry out the activities that steer and manage society (Kooiman 2003). Some have argued that civil society's involvement in urban environmental stewardship and in other sustainable development initiatives is required for sustainable environmental governance (Adger and Jordan 2009; Griffin 2010). Likewise, stakeholder engagement is considered a critical component of sustainable urban forest management (Kenney and Fraser 2011). In many cities, the civil society sector (i.e. informal grassroots groups, non-profit organizations, community groups) are actively involved in stewarding trees and green spaces on publically owned land (Svendsen and Campbell 2008). Many large-scale 'million-tree' programs assume that residents and other property owners will take on responsibility for maintaining newly planted trees. However, it is unclear what role residents believe they should play in urban forest governance. To answer this question, I conducted an on-site survey of residents in two New York City neighborhoods. Questions were asked about what entities they think should be responsible for taking care of trees planted in their neighborhood. Using binary logistic regression, I measured how these beliefs were influenced by residents' attitudes toward trees, level of previous involvement in urban tree care, awareness of recent tree planting and an interest to learn more about trees. This chapter is being prepared for submission to *Landscape and Urban Planning*.

In Chapter 4, I apply theoretical frameworks from human ecology and community and environmental psychologies to the context of stakeholder engagement in urban tree stewardship. Community health research conducted in these disciplines is concerned with factors in the social, cultural and environmental (built and natural) contexts that promote or foster the health and well-being of individuals and groups, and with the ways that community contexts can be altered to facilitate positive behavior change. I argue that, like community health interventions, urban tree planting campaigns must be accompanied by changes to the social, cultural and built environments that are designed to engage residents in tree stewardship. In this chapter, I conduct a literature analysis and propose an ecological model of behavior for the creation of stewardship-supportive urban environments. This chapter serves to develop theory on the levels of multiple factors that may influence engagement in urban forest stewardship. This chapter is a manuscript that was submitted and is currently in review with the *American Journal of Community Psychology*.

While I intend to share the findings of this thesis with other researchers by publishing my work in scholarly journals, it is also my hope that urban forestry practitioners will find my research useful for their own practice. Based on my personal previous experiences as an Extension educator and in interacting with educators and practitioners during the course of my thesis research, I am well aware that engaging stakeholders in urban forestry is incredibly challenging in practice. I acknowledge that this thesis may not even begin to address these challenges. Thus, this thesis is to be viewed as an initial exploration into the complexities of the practice of community education, the governance of natural resources, and the influencing factors on stewardship behavior in the context of urban forest management.

REFERENCES

- Adger, W.N. and A. Jordan. 2009. *Governing Sustainability*. Cambridge University Press Cambridge.
- Austin, M.E. 2002. Partnership opportunities in neighborhood tree planting initiatives: Building from local knowledge. *Journal of Arboriculture* 28 (4): 178-186.
- Bloniarz, D.V. and H.D.P. Ryan. 1996. The use of volunteer initiatives in conducting urban forest resource inventories. *Journal of Arboriculture* 22 (2): 75-82.
- Boyce, S.E. 2011. It takes A stewardship village: Is community-based urban tree stewardship effective? *Cities and the Environment* 3 (1): Article 3.
- City of New York. 2007. PlaNYC: A Greener, Greater New York.
- Dwyer, J.F., G.M. Childs, and D.J. Nowak. 2000. Forestry in urban and urbanizing areas of the United States; connecting people with forest in the 21st century. In *Forests and Society: The Role of Research: Sub-Plenary Sessions, Volume 1*. Ed. B. Krishnapillay, E. Soepadmo, A.H.H Wong, S. Appanah, S.W. Chik, N. Manokaran, H.L. Tong, and K.K. Choon. 21st IUFRO World Congress. Kuala Lumpur, Malaysia 7-12 August 2000. [Vienna, Austria: International Union of Forest Research Organizations]: 629-637.
- Elmendorf, W. 2008. The importance of trees and nature in community: A review of relative literature. *Arboriculture & Urban Forestry* 34 (3): 152-156.
- Faber Taylor, A. and F.E. Kuo. 2009. Children with attention deficits concentrate better after walk in the park. *Journal of Attention Disorders* 12 (5): 402-409.
- Friends of Trees. 2011. About Us. <http://friendsoftrees.org/who-we-are/about-us>.
- Friends of the Urban Forest. 2011. About FUF. <http://www.fuf.net/about/index.html>.
- Griffin, L. 2010. Governance innovation for sustainability: Exploring the tensions and dilemmas. *Environmental Policy and Governance* 20 (6): 365-369.
- Grimm, N.B., S.H. Faeth, N.E. Golubiewski, C.L. Redman, J. Wu, X. Bai, and J.M. Briggs. 2008. Global change and the ecology of cities. *Science* 319 (5864): 756-760.

- Helms, J.A. 2002. What do these term means? Forest. Forestry. Forester. *Journal of Forestry* 100 (8): 15-19.
- Johnston, M. and L.D. Shimada. 2004. Urban forestry in a multicultural society. *Journal of Arboriculture* 30 (3): 185-192.
- Kenney, W.A., P.J.E. van Wassenae, and A.L. Satel. 2011. Criteria and indicators for strategic urban forest planning and management. *Arboriculture & Urban Forestry* 37 (3): 108-117.
- Kooiman, J. 2003. *Governing As Governance*. London: SAGE Publications.
- Kuo, F.E., W.C. Sullivan, R.L. Coley, and L. Brunson. 1998. Fertile ground for community: Inner-City neighborhood common spaces. *American Journal of Community Psychology* 26 (6): 823-851.
- Kuo, F.E. and W.C. Sullivan. 2001. Aggression and violence in the inner city: Effects of environment via mental fatigue. *Environment and Behavior* 33 (4): 543-571.
- Lu, J. W.T., E.S. Svendsen, L.K. Campbell, J. Greenfeld, J. Braden, K L. King, and N. Falxa-Raymond. 2010. Biological, social and urban design factors affecting youth street tree mortality in New York City. *Cities and the Environment* 3 (1): Article 1.
- McPherson, E.G. 2006. Urban forestry in North America. *Renewable Resources Journal* 24 (3): 8-12.
- Pincetl, S. 2010. From the sanitary city to the sustainable city: Challenges to institutionalizing biogenic (nature's services) infrastructure. *Local Environment* 15 (1): 43-58.
- Sklar, F. and R.G. Ames. 1985. Staying alive: Street tree survival in the inner-city. *Journal of Urban Affairs* 7 (1): 55-66.
- Sommer, R., F. Learey, J. Summit, and M. Tirrell. 1994. The social benefits of resident involvement in tree planting. *Journal of Arboriculture* 20 (3): 170-175.
- Summit, J. and R. Sommer. 1998. Urban tree-planting programs--a model for encouraging environmentally protective behavior. *Atmospheric Environment* 32 (1): 1-5.
- Svendsen, E.S. and L.K. Campbell. 2008. Urban ecological stewardship: Understanding the

structure, function and network of community-based urban land management. *Cities and the Environment* 1 (1): Article 5.

———. 2010. Living memorials: Understanding the social meanings of community-based memorials to September 11, 2001. *Environment and Behavior* 42 (3): 318-334.

Tennessen, C.M. and B. Cimprich. 1995. Views to nature: Effects on attention. *Journal of Environmental Psychology* 15 (1): 77-85.

Tidball, K.G., M.E. Krasny, E. Svendsen, L. Campbell, and K. Helphand. 2010. Stewardship, learning, and memory in disaster resilience. *Environmental Education Research* 16 (5): 591-609.

TreesNY. 2011 "Citizen Pruner Tree Care Course." <http://www.treesny.org/citizen-pruner-tree-care-course> (accessed October 7, 2011).

Wells, N.M., G.W. Evans, and Y. Yang. 2010. Environments and health: Planning decisions as public health decisions. *Journal of Architectural Research and Planning* 27 (2): 124-143.

Westphal, L.M. 2003. Urban greening and social benefits: A study of empowerment outcomes. *Journal of Arboriculture* 29 (3): 137-147.

Young, R.F. 2011. Planting the living city. *Journal of the American Planning Association* 77 (4): 368-381.

CHAPTER TWO: AN EXAMINATION OF THE PRACTICE OF STAKEHOLDER ENGAGEMENT IN URBAN FORESTRY

Abstract

Urban forestry practitioners play an important role in engaging stakeholders, such as residents and property owners, in tree planting and stewardship. Previous research has identified stakeholder engagement approaches for stakeholder analysis, communication, education and empowerment, but the relationships between these approaches have not been previously examined. To explore this issue, semi-structured interviews (n=21) were conducted between 2010-2011 with urban forestry practitioners from across the United States to better understand their approaches used in stakeholder engagement. Using a grounded theory approach to uncover emergent themes and evidence of concepts from the literature, results reveal that personal conversations are a commonly used strategy for communicating with stakeholders, for gathering information about stakeholder audiences, and for involving residents in tree planting decisions during stakeholder analysis. Many interviewees' conduct neighborhood tree planting programs to educate stakeholders about urban forestry that include organizational processes for the empowerment of program participants. Many of these programs include community organizing and leadership trainings as a vehicle for empowering volunteers to act as community leaders and advocates for urban tree planting and stewardship. Challenges related to engaging low-income, non-English speaking communities were identified that present a "low-hanging fruit problem" in which stakeholders are primarily engaging the stakeholders that are easiest to reach (i.e. that speak English, that have the resource to plant trees). Results demonstrate that stakeholder analysis informs the communication approach more than it informs engagement approaches for the education or empowerment of stakeholders.

Introduction

Stakeholders are broadly defined as people, groups or organizations that influence or who are affected by a management decision (Reed et al. 2009). Stakeholder engagement is an element of collaborative natural resource management in which multiple stakeholder groups actively participate in decision-making processes and management activities surrounding a natural resource management issue (Conley and Moote 2003). Beneficial outcomes of collaborative natural resource management can include increased social capital, conflict resolution between stakeholders, and plans and policies that are viewed as legitimate by stakeholders (see Conley and Moote 2003; Reed et al. 2009). One specific area of natural resource management where collaborative management concepts have been applied is urban forestry (see Clark et al. 1998; Kenney and Fraser 2011). Stakeholder engagement is important in urban forestry because residents, property owners, businesses and their employees can be affected by urban tree planting activities and they can take actions to enhance (or to inadvertently harm) the health of urban trees and forests (Austin 2002). Engaging stakeholders in the planning, planting and maintenance of urban trees can result in the development of social capital at the individual (Sommer et al. 1994) and community level (Elmendorf 2008), and enhance the community's satisfaction with urban forestry activities (Sipila and Tyrvaainen 2005).

In this chapter, stakeholder engagement in urban forestry refers to the practices of urban forestry practitioners (in the government and non-profit sectors) working to engage different stakeholder audiences in urban tree planting and stewardship. The goal of stakeholder engagement practices in this context is to enable stakeholders to actively plant and care for trees in their community, and to provide input into tree planting decisions (Clark et al. 1997). The practice of stakeholder engagement is a process that entails specific approaches and strategies for

involving stakeholders in management (Reed 2008). Urban forestry research on stakeholder engagement has focused on specific approaches for engaging stakeholders: 1) stakeholder analysis (instrumental and normative) 2) effective communication, 3) education, and 4) empowerment of stakeholders. For example, stakeholder analysis is the process of gathering information about stakeholders' interests, needs, and spheres of influence associated with a management issue (instrumental stakeholder analysis) and involving stakeholders in the decision-making process (normative stakeholder analysis) (Reed et al. 2009). Stakeholder analysis is necessary for understanding stakeholders' position on an issue and for involving them in decisions that may affect them. A lack of knowledge about stakeholders and excluding them from decision-making processes has resulted in urban greening project failures (see Yang and Xijiang 2007). Effective communication entails the dissemination of information about urban forestry topics (e.g. the benefits of urban trees) in a manner that resonates with stakeholder audiences. Education encompasses events and activities in which stakeholders learn about and actively participate in urban forestry activities, such as urban tree plantings (Elmendorf 2008). Empowerment entails processes through which stakeholders develop skills to organize and facilitate urban forestry related activities in their community (Westphal 2003).

While researchers have documented specific approaches that are used to implement each of the four approaches noted above, they are often analyzed as solitary events, rather than as stages within the engagement process (Figure 2.1). Although the use of these approaches to engage stakeholders has been documented (bold lines), it is not clear how the methods used within each approach informs (if at all) subsequent engagement practices for effective communication, education and empowerment (dashed lines).

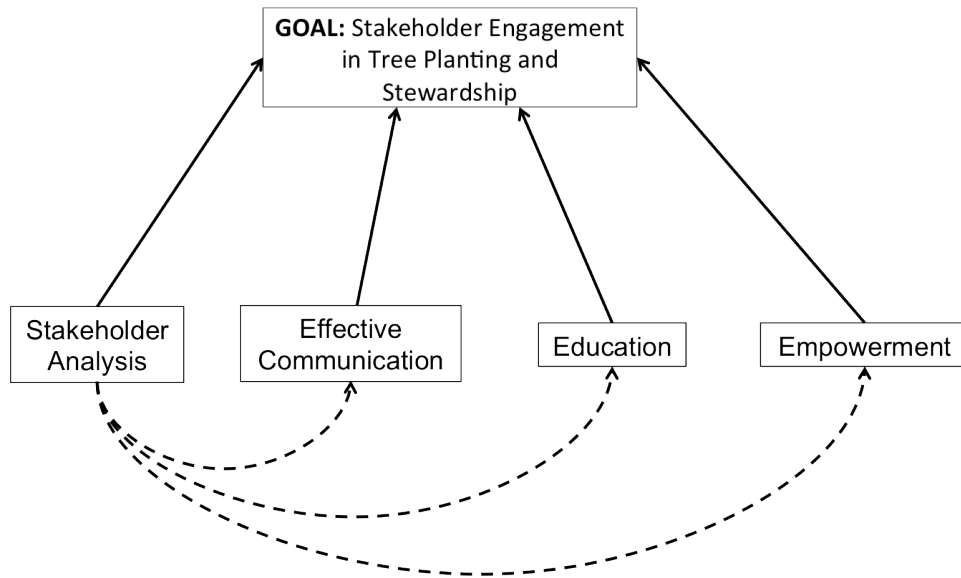


Figure 2.1: Conceptual model of the approaches used for stakeholder engagement in urban forestry. Dashed arrows indicate relationships between methods to be examined in this study.

An examination of the relationships between these approaches may provide better insight into the process of engagement, which may be useful for urban forestry practitioners as they strategize how to engage different stakeholder audiences. To gain this insight, in-depth interviews with urban forestry practitioners in the United States were undertaken to answer the following research questions:

1. How does stakeholder analysis inform communication, education and empowerment for the purpose of engaging stakeholder in tree planting and stewardship?
2. What strategies are employed by UF practitioners to conduct stakeholder analysis and to communicate, educate and empower stakeholders to plant and care for urban trees?
3. What challenges do practitioners face in the process of stakeholder engagement?

I will first discuss the outcomes of stakeholder engagement in urban forestry

In this chapter, I will first review literature on the stakeholder engagement approaches of stakeholder analysis, communication, education and empowerment, as well as review the known

challenges for engaging stakeholders in tree planting and stewardship. I will then describe the interview methodology and data analysis. After presenting the results, I will discuss key insights learned about the stakeholder engagement processes through which urban forestry practitioners work to engage audiences in tree planting and stewardship.

Outcomes of Stakeholder Engagement in Urban Forestry

The goal of urban forestry stakeholder engagement is to enable stakeholders to become actively involved in the planting and stewardship of urban trees. The involvement of stakeholders in urban forestry produces beneficial outcomes for individuals, communities and urban forests. Planting and caring for trees exposes people to natural settings. Visual and physical access to nature has been associated with mental and physical health outcomes, such as improved attention span and cognitive functioning (see Frumkin 2001 for a review). Stewardship also engages participants in physical activity and exercise (Pillemer et al. 2010). Individuals who plant trees in their community feel a sense of satisfaction and ownership over the trees (Sklar and Ames 1985), and derive a sense of enjoyment from working with others during planting activities (Sommer et al. 1994; Grese et al. 2001) and a sense of pride and accomplishment for taking actions to improve their community through planting trees (Lipkis and Lipkis 1990; Westphal 2003).

Stakeholder engagement in tree planting and stewardship can produce community-level benefits such as strengthened social ties between neighbors (Summit and Sommer 1998) and may lead to the development of proactive citizen groups that advocate for urban forests. (Bloniarz and Ryan 1996; Westphal 2003). Some have hypothesized that social acts of stewardship may lead to improved public health and safety (Svendsen and Campbell 2008). For

example, well-maintained vegetated outdoor common spaces encourages residents to gather and interact socially; that can foster social ties and a greater sense of community and safety among residents (Kuo et al. 1998). Well-maintained urban green spaces have also been associated with lower rates of violent and property crimes than areas without vegetation (Kuo and Sullivan 2001; Donovan and Prestemon 2010). Thus, collective acts of stewardship may act synergistically to create a physical landscape that provides social benefits to urban communities. Furthermore, efforts by stakeholders to provide basic care to trees can ensure that urban trees are sustained. Recent research has demonstrated that stewardship can significantly decrease the mortality rate of urban trees (Lu et al. 2010; Boyce 2010), which can ultimately ensure the healthy functioning of urban forest ecosystems. Stakeholder engagement in tree planting and stewardship is the vehicle through which these benefits can be achieved and sustained. Research on stakeholder engagement approaches in urban forestry are discussed in the following sections.

Stakeholder Engagement Methods in Urban Forestry

Approach 1: Stakeholder Analysis

Stakeholder analysis includes instrumental and normative approaches (Reed et al. 2009). Instrumental stakeholder analysis is used to gather information about stakeholders' attitudes, level of knowledge and behaviors related to a specific management issue. Instrumental stakeholder analysis has been conducted in urban forestry (Table 2.1) and is used by practitioners to better understand stakeholders' relationships with urban trees, and their values and attitudes about urban forests (Clark et al. 1997; Dwyer et al. 2000). This analysis can inform strategies for the dissemination of information about a specific management practice to different stakeholder groups (Johnston et al. 2004).

Table 2.1: Methods, target audiences and intended outcomes for the instrumental stakeholder analysis approach to stakeholder engagement in urban forestry.

| Method | Audience | Intended Outcomes | Literature Cited |
|-------------------------------|--|---|---|
| Stakeholder mapping | (not specified) | To identify the interests, positions, skills, affiliations, sources of power, sphere of influence, valued landscapes that are to be included in the evaluation of management and comprehensive plans | Elmendorf and Luloff 2001; Thompson et al. 2005 |
| Key informant Interviews | Senior government staff; Senior elected officials; Industry representatives; Local environmental organizations; Teachers, educators; Leaders of minority groups; Leaders of religious groups; Leaders of groups with opposing interests; Youth | To obtain an in-depth view of people, places, activities, existing programs or issues in a community | Iles 1998; Elmendorf and Luloff 2001; McClean and Jensen 2004; Thompson et al. 2005 |
| Snowball sampling | Key informant interviewees | Identification of additional relevant stakeholders to speak with; Identification of potential local partners | Elmendorf and Luloff 2001; Thompson et al. 2005 |
| Focus groups | Representative from stakeholder audiences | Determine the salience of an issue for a target audience, understand language people use to understand and discuss a certain issue, help to translate theory into survey questions, to help interpret survey results | Elmendorf and Luloff 2001 |
| Research | (not specified) | Research (questions, methods, data collection and analysis, conclusions) based on local knowledge information, experience, perspective and needs provided by collaborating stakeholders; this can include surveys or other methods of data collection, as well as participatory action research | Thompson et al. 2005 |
| Direct one on one interaction | Ethnic groups; inner city residents; the elderly | Through dialogue, non-traditional audiences are reached, listened to and included in urban forestry | Summit and Sommer 1998; Thompson et al. 2005; Johnston and Shimada 2004 |

Table 2.1 (continued)

| Method | Audience | Intended Outcomes | Literature Cited |
|---------------------------|-----------------|---|-------------------------|
| Neighborhood observations | Residents | Social dynamics and interactions are understood in places where future projects may occur | Austin 2002 |

There are several ways that data can be collected in instrumental stakeholder analysis (Table 2.1). Interviews of key informants can be conducted; key informants are those community members that possess knowledge about the people, social activities, and local community issues that may influence urban forestry activities (Elmendorf and Luloff 2001). Key informants can be interviewed individually or as part of focus groups, which are small group discussions about a specific issue. Focus groups can be effective for people who feel more comfortable sharing their ideas and opinions in a group setting rather than in an individual interview (Elmendorf and Luloff 2001; Thompson et al. 2005). Interviewees can be asked to suggest additional community members who may have additional information or knowledge that could be of help to urban forestry practitioners. This strategy is called ‘snowball-sampling’ because it relies on existing key informants to increase the numbers of additional contacts to interview. The snowball sampling process can help practitioners to identify strong leaders and organizations who may become future partners on an urban forestry initiative (Thompson et al. 2005).

The information collected through key informant interviews and snowball sampling can be visually documented. Stakeholder mapping (Table 2.1) is a group activity in which participants work together to draw a map of people and organizations that they identify as stakeholders for a particular issue. The mapping process entails identifying and depicting the position, interests, skills, intra and extra group dynamics and their sources of power and influence of the identified stakeholders. Having different groups draw stakeholder maps for the same issue can result in a more complete picture of the relationships between stakeholders

(Elmendorf and Luloff 2001). In sacred place mapping, stakeholders draw maps and pictures of important places in the community. These drawing can help practitioners to identify places that community members want protected or enhanced during urban greening and community development initiatives. Elmendorf and Luloff (2001) describe a large-scale sacred place mapping activity in Pennsylvania in which community members took a tour of their county and then mapped sacred places in the area. This exercise revealed over 150 sacred places that were shared with local elected officials during their planning processes.

Gathering information from hard-to-reach audiences (ethnic groups, inner city residents and the elderly) may require direct face-to-face interactions and conversations (Table 2.1) (Thompson et al. 2005). Although this strategy is time consuming, it can help to build trust and established contact with these audiences. Another information gathering strategy that can be used with underrepresented groups are oral and shared histories. In this exercise, people are asked to write or verbally describe their perspective about an issue. These stories can be shared among small groups to cultivate dialogue about an issue (Thompson et al. 2005). Others have argued that observing areas and neighborhoods (Table 2.1) where an urban forestry program may be implemented in the future is also an effective strategy for gathering information about stakeholders. Walking around a neighborhood or a specific site can allow practitioners to observe the type of people who use the site, the types of social activities that occur there and the ways in which the site is used. Interacting with community members during these observations can also uncover local knowledge about the area and additional community members to contact for key informant interviews or focus groups (Austin 2002).

Normative Stakeholder Analysis

Stakeholder analysis can also be conducted using a normative approach (Table 2.2). In normative stakeholder analysis, stakeholders participate in the urban forest management planning and decision-making process (Reed et al. 2009). There are numerous beneficial outcomes of normative stakeholder analysis (also known as participatory planning) in urban forestry. Normative stakeholder analysis allows stakeholders to voice their needs, concerns and preferences for urban forest management (Thompson et al. 2005; Dwyer et al. 2000). During this process, stakeholders become familiar with the decision-making process (Clark et al. 1997) and are introduced to community officials, such as city planners and elected officials (Westphal 2003; Janse and Konijnendijk 2007). Urban forest managers and practitioners also become familiar with stakeholders' unique viewpoints and knowledge about urban forest management issues in their community (Janse and Konijnendijk 2007). Normative stakeholder analysis can lead to an urban forest management plan that reflects the interests of multiple stakeholders (Dwyer et al. 2000; Applestrand 2002; Thompson et al 2005) and that meets the needs and desires of the local community (Westphal 2003). Participation in urban forest management planning and decision-making can also instill a sense of ownership and accomplishment when stakeholders see their contributions to the plan implemented in their community (Janse and Konijnendijk 2007).

Table 2.2: Methods, target audiences and outcomes of normative stakeholder analysis in stakeholder engagement for urban forestry

| Method | Audience | Intended Outcomes | Literature Cited |
|---|---|---|--|
| Inclusion of diverse audiences in planning processes | (Not specified) | Experiential and local sources of knowledge shared; Stakeholders are introduced to city officials, elected leaders, urban foresters; Resulting plan is more likely to be viewed as legitimate by the community | Westphal 2003; Janse and Koninwendijk 2007; Appelstrand 2002; Elmendorf 2008 |
| Public meetings; workshops; citizen advisory councils; Accessible public meetings | (Not specified) | Meetings that invite the participation of stakeholders. Having multiple ways of participating may increase participation. Ensuring that meetings are accessible so that disenfranchised audiences are able to attend meetings | Chess and Purcell 1999; Johnston and Shimada 2004 |
| Conflict resolution | (Not specified) | Agreement among groups with opposing opinions and viewpoints, identifying common interests; saves economic costs associated with a future failed plan | Appelstrand 2002; Thompson et al. 2005 |
| Hire liasons | (Not specified) | To facilitate conflict resolution and successful planning outcomes | Chess and Purcell 1999 |
| Early involvement of stakeholders | Nnot specified) | Stakeholders are not placed in a reactive position and so that they don't perceive a plan is finalized | Chess and Purcell 1999 |
| Vision galleries | Youth | Opposing groups are able to see, describe and discuss common issues and concerns | Elmendorf and Luloff 2001 |
| Solicit community input about greening projects | The neighborhood where future projects will occur | The project reflect the community's needs and desires and that it addresses important issues in the community | Westphal 2003 |
| Ask people where they want trees to be planted | The neighborhood where future projects will occur | Education of tree planting practices, higher likelihood people will be satisfied with the trees | Sommer and Cecchettiini 1992 |

Normative stakeholder analysis strategies in urban forestry (Table 2.2) can include holding public meetings, hosting task-oriented workshops, creating citizen advisory committees, and using technology such as interactive websites (Chess and Purcell 1999). Offering multiple ways that stakeholders can participate can ensure that these forums are accessible to as many stakeholders as possible (Johnston and Shimada 2004). Involving stakeholders early in planning and decision-making processes allows stakeholders' interests to be identified and shared and leaves time for consensus building and conflict resolution (Chess and Purcell 1999; Appelstrand 2002; Thompson et al. 2005). One strategy for fostering discussion among stakeholders during the planning process is the use of vision galleries. In this activity, small groups of stakeholders work together to draw pictures that describe their vision for the community issue of interest. Sharing the pictures can help groups see, describe and discuss areas of common interest and to better understand each group's stance on the issue (Elmendorf and Luloff 2001).

Normative stakeholder analysis can continue during and after the implementation of urban forestry projects. For example, allowing stakeholders to be involved in the decision to plant a tree outside of their home or property is an example of participatory planning at the local, neighborhood block level. Asking residents where they want trees planted can enable urban foresters to gain an understanding about citizen's desires and concerns related to tree plantings (Sommer and Cecchetti 1992). After projects are implemented, urban forestry practitioners and managers can continue dialoguing with residents to identify any concerns or needs that have arisen related to the maintenance of urban forestry projects (Austin 2002; Westphal 2003).

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Approach 2: Effective communication

Effectively communicating with stakeholders is necessary for engaging different audiences in urban forestry activities. Strategies for effective communication have been discussed in urban forestry research, primarily in the context of engaging ethnic and cultural minorities and underserved communities (Table 2.3). These communication strategies include providing educational materials and conducting educational programs in multiple languages. Exercising sensitivity to different cultural groups can build trust between urban forestry practitioners and these communities (Iles 1998; Johnston and Shimada 2004). Communication about urban forestry or urban trees can be linked to the social and economic benefits that trees can provide to the community because trees produce benefits may address the other challenges the neighborhood is facing, such as crime and unemployment (Johnston and Shimada 2004). This communication strategy can also be effective for persuading government and business stakeholders to become involved in and to support urban forest management activities (Summit and McPherson 1998). Clarifying which groups will enjoy the benefits is a communication strategy that can prevent the disappointment of stakeholders who expect to benefit from urban forestry projects (Westphal 2003).

Table 2.3: Methods, target audiences and outcomes of effective communication in stakeholder engagement for urban forestry

| Method | Audience | Intended Outcomes | Literature Cited |
|--|--|--|--|
| Multi-lingual communication and materials | Ethnic and cultural minorities | Information is shared with non-English speaking audiences | Iles 1998; Johnston & Shimada 2004 |
| Exercising cultural sensitivity | Ethnic and cultural minorities; People with physical disabilities | Trust is built, respect and tolerance are demonstrated | Iles 1998; Johnston & Shimada 2004 |
| Link benefits of trees to social and economic issues, and other issues of interest to stakeholders | Underserved communities; Government; Businesses | Avoid “overdosing” people on a subject that is insignificant to unemployment, crime, etc.; Property owners are convinced of the benefits of planting trees | Johnston & Shimada 2004; Summit and McPherson 1998 |
| Clarify to where and to whom the benefits of urban forestry will accrue | Residents in target neighborhoods for urban greening projects | Prevention of disappointment when people don’t see or enjoy beneficial results | Westphal 2003 |
| Personal communication | Potential volunteers; Ethnic groups; Inner city residents; The elderly | Building trust and respect by personally asking people to participate in volunteer activities or in the participatory planning process | Still and Gerhold 1997; Johnston and Shimada 2004 |

Personal, face-to-face communication may be an effective strategies for recruiting potential volunteers for tree planting programs. Recall that face-to-face strategies are also useful for conducting stakeholder analysis with marginalized groups. Personally asking people to volunteer may help to recruit additional participants outside the pool of people who consistently volunteer (Still and Gerhold 1997). Face-to-face conversations with members of hard-to-reach audiences (ethnic groups, inner city residents and the elderly) might increase the involvement of

these groups in urban forest planning efforts (Johnston and Shimada 2004).

Approach 3: Educational Programs

Raising stakeholders' knowledge and awareness about urban forestry is a central objective of stakeholder engagement (Dwyer et al. 2002). Educational programming and other educational strategies are used to introduce stakeholders to urban forestry (Table 2.4). For example, educational events offered to the community can include festivals, arts project, guided tree tours and open houses to meet urban foresters. Educational exhibits and promotional materials (e.g. brochures) can also be used to educate stakeholders about urban forest management. Offering these materials and educational events in different languages can increase the audiences reached by these efforts (Johnston and Shimada 2004); this strategy was also discussed in the effective communication section above.

Community tree planting and stewardship programs hosted by non-profit organizations have been discussed in urban forestry literature more than any other educational strategy (Sklar and Ames 1985; Sommer et al. 1994; Summit and Sommer 1998; Dwyer et al. 2000; Austin 2002; Elmendorf 2008). Community tree plantings are typically daylong events in which residents and volunteers work together to plant trees in a neighborhood or in a local park (e.g. Sommer et al. 1994). Beyond involving volunteers in tree planting, educational programs are frequently offered that train participants and volunteers in tree planting and stewardship skills, such as pruning techniques and species identification (see Still and Gerhold 1997; Dwyer et al. 2000). Some municipalities train volunteers in tree species identification, who then assist urban forest managers to conduct urban forest resource inventories (Bloniarz and Ryan 1996; Cotroneo and Gerhold 2008).

Table 2.4: Methods, target audiences and outcomes of education in stakeholder engagement for urban forestry

General Education Activities

| Method | Audience | Intended Outcomes | Literature Cited |
|---|--|--|--|
| Offer programs in different languages | Ethnic and cultural minorities | Information is disseminated to as many different groups as possible | Johnston and Shimada 2004 |
| Promotional materials | (not specified) | Interest in urban forestry is stimulated | Johnston and Shimada 2004 |
| Environmental education projects | Schools (students); Youth | Interest in urban forestry is stimulated | Johnston and Shimada 2004; Elmendorf 2008 |
| Informal lectures | Community groups | Interest in urban forestry is stimulated | Johnston and Shimada 2004 |
| Urban foresters meet community members | (not specified) | Interest in urban forestry is stimulated | Johnston and Shimada 2004 |
| Exhibitions and displays | Schools (students); Visitors to libraries, civic buildings and community centers | Interest in urban forestry is stimulated | Dwyer et al. 2000; Johnston and Shimada 2004 |
| Tree walks | Ethnic and cultural minorities | The community is introduced to the urban forest | Johnston and Shimada 2004 |
| Festivals | Ethnic and cultural minorities | The community identifies more closely with the urban forest | Johnston and Shimada 2004 |
| Arts projects with an environmental theme | Ethnic and cultural minorities | The community is able to express their cultural identity within an environmental theme | Johnston and Shimada 2004 |

Table 2.4: (continued)

| <i>Tree planting and stewardship educational activities</i> | | | |
|---|--|--|--|
| Method | Audience | Intended Outcomes | Literature Cited |
| Neighborhood tree planting days and stewardship projects | Residents; All stakeholders | Stakeholders are directly involved in tree planting and stewardship as part of day long events to plant and care for trees in a local neighborhood or urban park | Sklar and Ames 1985; Sommer et al. 1994; Still and Gerhold 1997; Summit and Sommer 1998; Grese et al. 2001; Austin 2002; Elmendorf 2008; Tidball et al. 2010 |
| Volunteer programs and trainings | Volunteers | Volunteers receive advanced training in tree planting and stewardship skills (e.g. conducting city-wide street tree inventories) | Bloniarz and Ryan 1996; Still and Gerhold 1997; Dwyer et al. 2000; Austin 2002; Moskell et al. 2010; Fisher et al. 2010 |
| Planting culturally appropriate tree species | Ethnic communities | Opportunity for cultural expression | Johnston and Shimada 2004 |
| Partnering with local organizations | Neighborhood associations; Community groups | To recruit participants | Dwyer et al. 2000; 2002; Johnston and Shimada 2004 |
| Understand volunteer motivations | Volunteers | To design programs that will fulfill the motivations of people to plant trees | Still and Gerhold 1997; Moskell et al. 2010; Fisher et al. 2010 |
| Have a plan for maintenance after tree plantings | Residents; Neighborhood leaders; Maintenance workers | To ensure trees are maintained | Austin 2002 |
| Maintain follow up contact with individuals involved in planting projects | Neighborhood leaders; Maintenance workers | Determine if any community needs have arisen since the planting project | Austin 2002 |

Understanding people's motivations for participating urban tree planting and stewardship programs is necessary in instrumental stakeholder analysis as well as during the design and implementation of tree planting programs. Beyond understanding people's initial reasons for volunteering, it is also necessary to recognize their motivations for participating in different tasks during a program. Still and Gerhold (1997) found that many volunteers preferred to be involved in tree planting, while far fewer preferred to conduct fundraising or lobbying. Understanding the motivations and task preferences of volunteers can inform the design of urban forestry programs that fulfill participants' motivations so that they are satisfied with their experiences and continue to be involved (Moskell et al. 2010). The long-term involvement of volunteers and participants in stewardship is necessary for ensuring that the trees planted as part of urban forestry programs survive (Austin 2002). Providing participants with information about tree maintenance can ensure that they know how to take care of the trees they received or helped to plant as part of a community program (Summit and McPherson 1998). Implementing a follow-up maintenance plan in which local residents agree to continually maintain the trees can ensure that the community remains engaged in the project and that the trees receive basic care in the future (Austin 2002). Maintaining contact with the residents who will implement the maintenance plan may make it easier for the residents to report any problems that may arise related to the project, and for the practitioner to intervene to address those issues (Austin 2002; Westphal 2003).

Approach 4: Empowerment

Stakeholder engagement in tree planting and stewardship can result in the empowerment of participants (Dwyer et al. 1992; Lipkis and Lipkis 1990; Blonizarz and Ryan 1996; Westphal 2003; Elmendorf 2008). Empowerment is a multi-level construct because it can occur in

individuals, organizations and communities. Empowerment theory in community psychology makes an important distinction between empowered and empowering individuals, organizations and communities. For example, an empowered individual may exhibit the features of psychological (individual-level) empowerment, which includes 1) the personal belief that one can influence outcomes (self-efficacy), 2) a critical awareness of the socio-political environment and 3) the involvement in activities to exert control over one's life (Zimmerman 2000). However, this empowered person is not necessarily empowering other people. Although empowerment can occur at individual, organization, and community levels, empowerment at one level may not translate to empowerment at another level. Furthermore, empowerment is population and context specific because a person may be empowered to act with regard to a particular community organization but they may not be empowered in their workplace. Also, empowerment may differ between types of people—for example youth may be empowered very different than are the elderly (Zimmerman 2000).

In the context of urban forestry, empowerment has been discussed as an individual-level outcome of neighborhood or community tree planting projects (refer to Table 2.1 presented earlier). For example, Dwyer et al. (1992) argues that tree planting projects result in “a stronger sense of community, empowerment of inner city residents to improve neighborhood conditions, and promotion of environmental responsibility and ethics,” (p. 231). Lipkis and Lipkis (1990) contend that utilizing volunteers in urban forest resource inventories can achieve citizen empowerment. Similarly utilizing volunteers to conduct street tree inventories can empower volunteers “to play a critical role in the development of a better community,” (Bloniarz and Ryan 1996, p. 81-82). In examining the social outcomes of an urban greening project in Chicago, Westphal (2003) observed leaders who were themselves empowered, but who were not

empowering for other people. She found that their dominating style of leadership actually discouraged other community members from becoming meaningfully involved in the project (Westphal 2003). These references to empowerment within urban forestry research relate to action-competence in environmental education. Action-competence refers to participants' strengthened abilities to act upon their environmental concerns, as well as other personal and societal concerns may not necessarily relate to environmental issues (Jensen and Schnack 1997).

Recall that individual-level empowerment was previously discussed in stakeholder analysis as an outcome of stakeholder participation in urban forest planning. In this section, I am referring to the process of empowerment. Urban forestry research has paid less attention to the approaches used by urban forestry organizations to empower participants. Organizational empowerment, defined as “organizational efforts that generate psychological empowerment among members and organizational effectiveness needed for goal achievement,” (Peterson and Zimmerman 2004, p. 138). Within empowerment theory, there is also an important distinction between *empowering* and *empowered* organizations. An *empowered* organization is able to influence the larger socio-political system of which it is a part whereas an *empowering* organization is able to produce psychological empowerment for its members as part of its internal organizational processes (Peterson and Zimmerman 2004). These features are not mutually exclusive because an organization can be both *empowered* to affect system changes and *empowering* to the individuals within the organization to gain self-efficacy.

Maton (2008) identifies six features of *empowering* organizations. First, they have a group-based belief system, defined as an ideology or set of values that specify patterns of behavior to achieve a desired goal. Second, they have core activities that are instrumental techniques used to develop self-efficacy and skills in its members. Core activities are engaging

and promote active learning among participants. The quality of activities is dependent upon the content of the activity and the facilitation of the activity by the organization. Third, empowering organizations have a relational environment that fosters social support, caring relationships and a sense of community among members. Fourth, they have an opportunity role structure, defined as the availability and configuration of roles within a setting that provides meaningful opportunities for participation, learning and development for individual members who may have different backgrounds, interests, skills and prior experiences. Fifth, key leaders in the organization are empowering, that is, they are able to inspire, motivate and empower others. Leadership in empowering organizations is shared and delegated, and is able to shift as new leaders emerge. Sixth, mechanisms are in place for the organization to adapt to internal and external challenges and changes. An example mechanism would be partnerships formed with other community groups to obtain resources for accomplishing goals. Peterson and Zimmerman (2004) identify incentive management as a seventh feature of empowering organizations, which entails offering incentives or reducing costs to facilitate participation in the organization.

A few of the seven features of empowering organizations (Maton 2008; Peterson and Zimmerman 2004) have been discussed in urban forestry literature, but not in reference to empowerment theory at the organizational level (Table 2.5).

Table 2.5: Method, target audiences and outcomes of empowering processes within urban forestry organizations

| Method | Audience | Outcomes | Literature Cited |
|--|--|---|--|
| Having a variety of tasks or ways to be involved in tree planting and stewardship in a program | Volunteers | Volunteer recruitment, satisfaction and retention | Still and Gerhold 1997 |
| Include underrepresented groups in urban forestry employees and volunteers | Ethnic and cultural minorities; Women | Workforce that reflects the community, workforce has inside local knowledge of the community, community acceptance and support for urban forestry programs; More equal representation of males and females | Johnston and Shimada 2004; Kuhns et al. 2002 |
| Identify empowering leaders | Community members where a project may be implemented | To ensure that project leaders are able to empower participants | Westphal (2003) |

For example, Still and Gerhold (1997) found that urban forestry volunteers preferred certain tasks more than others during community projects. The authors alluded to opportunity role structure when they suggested that volunteer programs have multiple ways that people can become involved in urban forestry projects. Others have discussed empowerment in terms of diversifying the employees of urban forestry organizations. Ethnic minorities and women have historically been underrepresented in the urban forestry workforce. Thus, Johnston and Shimada (2004) and Kuhns et al. (2002) suggest that urban forestry organizations strive to employ more people from these underrepresented groups so that urban foresters reflect the diversity of the community. Recall that other strategies for involving underrepresented groups have been mentioned in other approaches for stakeholder engagement. In her study of the implementation of an urban forestry project in a Chicago neighborhood, Westphal (2003) refers to empowering

processes at the organizational level. She recommends that practitioners observe whether empowered community leaders are empowering, or able to empower others. The leadership quality of local community members may be observed during stakeholder analysis or during the implementation of a project.

Challenges for Engagement

Urban forestry researchers have identified challenges for stakeholder engagement (Table 2.6). Inter-organizational challenges entail competing with other community events and programs that may leave little time for engagement in urban forestry in some people's lives. Intra-organizations challenges occur when urban forestry programs lack funding and program resources, or when their programs are unable to connect with stakeholders due to ineffective communication or low participation rates. Other challenges may stem from stakeholders' low level of interest, knowledge and awareness in urban forestry programs and negative perceptions toward environmental groups or trees. Challenges for engagement may be rooted in contested urban forest policies surrounding managing practices. Lastly, some neighborhoods may have neighborhood leaders that disempower and discourage community members from participating. Researchers have not investigated how these challenges influence strategies for stakeholder engagement, nor the strategies practitioners employ to overcome these obstacles.

Table 2.6: Challenges of Stakeholder Engagement

| Level of Challenges | Literature Cited |
|---|--|
| Intraorganizational Challenges | |
| People's busy lifestyles | Moskell et al. 2010 |
| Competitions with other issues and projects | Moskell et al. 2010 |
| Interorganizational Challenges | |
| Lack of funding | Bloniarz and Ryan 1996 |
| Lack of resources for programs | Moskell et al. 2010 |
| Inability to connect to audiences | Moskell et al. 2010; Johnston and Shimada 2004; Summit and McPherson 1998 |
| Low program participation rates | Summit and Sommer 1998 |
| Attitudes and Awareness Challenges | |
| Lack of interest | Moskell et al. 2010; Johnston and Shimada 2004 |
| Lacking a sense of responsibility | Moskell et al. 2010 |
| Lack of knowledge among the general public | Moskell et al. 2010 |
| Residential building managers' perception that residents don't like trees; that trees foster criminal activity | Kuo et al. 2003 |
| Negative perceptions of environmental groups | Johnston and Shimada 2004 |
| Frustrations associated with the involvement of new groups | Thompson et al. 2005 |
| Underrepresentation of women and minorities in urban forestry professions | Iles 1998; Johnston and Shimada 2004; Kuhns et al. 2004 |
| Difficult to identify stakeholders | Elmendorf and Luloff 2001 |
| Convincing private residents to plant trees | Summit and McPherson 1998 |
| Urban Forest Policy Challenges | |
| Controversy over management practices | Dwyer et al. 2000 |
| Controversy over processes leading to implementation of management practices (e.g. lack of information disseminated before plan adoption) | Dwyer et al. 2000 |
| Neighborhood Level Challenges | |
| Disempowering neighborhood leaders | Westphal 2003 |

The Present Study

This literature review on the approaches, strategies and challenges for stakeholder engagement in urban forestry informed the current study. One gap that remains in this literature is an understanding of the process of engagement that links these approaches together, such as the way in which stakeholder analysis informs subsequent efforts to communicate, educate and empower stakeholders. The purpose of this study was to investigate processes through which urban forestry practitioners employ the stakeholder analysis, communication, education and empowerment approaches as they work to engage their stakeholder audiences.

Methods

Twenty-one urban forestry professionals were interviewed between March 2010 and April 2011. Three sampling methods were used to identify these professionals: purposeful snowball and critical case sampling (Patton 1990). The criteria we used for sampling was 1) demonstrated knowledge or experience in activities or programs to engage a diverse range of stakeholders in urban forestry activities and 2) their potential to share successful strategies or particular challenges they have faced related to stakeholder engagement in urban forestry. We did not select participants based on the type of urban forestry organization in which they work (non-profit, government, private sector) because we wanted to gather insight on stakeholder engagement from a variety of perspectives from within the field of urban forestry. Twelve practitioners were purposefully identified from attendance and speaker lists of national urban forestry conferences held in 2009 and 2010. Ten of these participants agreed to participate. Two practitioners were identified based on the critical case of being involved in a large-scale ‘million-

tree' planting program implemented by local government in a city. An additional nine practitioners were identified via snowball sampling. Once practitioners were identified, an introductory email that described the study (framed as being focused on community engagement in urban forestry) was sent asking if they would be willing to participate in an interview. Interviews were conducted until practitioners revealed no new additional contacts to speak with through snowball sampling; an indication of saturation was the point at which practitioners identified people whom I had already interviewed.

Semi-structured interviewees were conducted in person (n=2) or by phone (n = 19). The initial questions in the interview guide focused on their organization's mission, a description of their role within the organization, a synopsis of the activities and/or programs they oversee and the target audiences and stakeholders for their programs (Appendix A). The last three quarters of the interview included key questions regarding stakeholder engagement. These questions focused on 1) how they connect to different audiences, 2) successful engagement strategies they have used, 3) challenges for engagement and 4) solutions for overcoming those challenges. The author conducted all interviews, and twenty interviews were digitally recorded; one participant did not feel comfortable being recorded, so detailed interview notes were taken instead. The interviews lasted in length from 20 minutes to 60 minutes, with most interviews lasting about 35 minutes.

Data Analysis

The first author transcribed the interviews, with the support of two research assistants trained in transcribing methods. Transcripts were coded and analyzed in Atlas Ti, a qualitative analysis software program. Data analysis was conducted using a grounded theory approach to uncover emergent themes and patterns in the data, and then to inductively derive theory about the

phenomenon of stakeholder engagement from the emergent concepts (Strauss and Corbin 1990). The data analysis process followed three steps. In the first stage (open coding), interview transcripts and notes were reviewed and coded based on emergent concepts and concept from the literature review. In the second stage (axial coding), the initial codes were compared and similar codes were grouped into categories or code families. Similar code families were grouped into themes and sub-themes and these are presented by the four stakeholder engagement approaches discussed above. In the final stage (selective coding), the relations between these approaches was identified and conceptualized to uncover the central phenomena in the data.

Results

In this section, I first provide a descriptive background of the participants and then present data on the four stakeholder engagement approaches ((stakeholder analysis (instrumental and normative), communication, education and empowerment for tree planting and stewardship)). Challenges experienced by practitioners during their use of these stakeholder engagement approaches are also presented. Within each approach, there were sub-themes consisting of similar categories of codes. Occasionally, sub-themes will be presented as tables depicting the code category names, the number of codes within the category and the number of quotations associated with the category. A few tables are focused on just one code category and the specific codes and associated number of quotations is presented. The most frequently discussed categories within each theme are explained further using direct quotations from the interviewees. Tables are not presented for each sub-theme because some of these lent themselves better to explanations by quotations directly from the interviewees. To protect the identities of the interviewees, each interviewee was assigned a code number. Also, references to their

organization or to geographical locations where they work were removed from the quotations.

Background of participants

Participants worked in twelve different states and one participant reported that she worked in multiple states. Interviewees were employees of municipal agencies, non-profit organizations, universities, or state government agencies (Table 2.7).

Table 2.7: Type of organization and geographical location of urban forestry practitioners

| Organization Type | Number of Interviewees | Interviewee Identification Numbers |
|--|-------------------------------|--|
| Non-profit | 12 | 1, 2, 5, 9, 10, 12, 13, 14, 16, 19, 20, 21 |
| City Government | 4 | 3, 11, 15, 18, |
| State Government | 2 | 6, 7 |
| University | 2 | 8, 17 |
| Commercial | 1 | 4 |
| Geographic Location of Organization | Number of Interviewees | Interviewee Identification Numbers |
| California | 4 | 5, 9, 20, 21 |
| Oregon | 3 | 11, 12 |
| New York | 2 | 13, 19 |
| Washington | 2 | 14, 15 |
| Georgia | 2 | 6, 10 |
| Colorado | 1 | 18 |
| Texas | 1 | 2 |
| Pennsylvania | 1 | 16 |
| Maryland | 1 | 3 |
| Indiana | 1 | 1 |
| Utah | 1 | 8 |
| Multi-State (Western U.S.) | 1 | 4 |
| New Mexico | 1 | 7 |

Seven practitioners were working in a city where a municipal initiative to plant one million trees or more was currently underway. One practitioner was working in a city with a municipal initiative to plant 100,000 trees over the next decade, and one practitioner was

working in a city to plant 5,000 trees over the next five years. Two practitioners said that their city had a goal to increase the tree canopy by more than 20% over the next decade or more. Professional titles among the participants included executive director, program manager, program director, volunteer coordinator and regional consultant. Thus, interviewees worked within the urban forestry sector at multiple levels and in a variety of professional positions. Many of the organizations are involved in tree planting activities, including the coordination of tree planting programs with different stakeholder groups (e.g. schools, volunteers, businesses), as well as training programs for tree planting and stewardship skills. Almost all of the practitioners discussed delivering educational programs or presentations to various stakeholder audiences. Many of the organizations were also involved in other environmental management and planning activities, such as storm water management, invasive species management, conservation easements and ecological restoration. Practitioners working at the state and local government level are involved in coordinating grant programs and providing resources to urban forestry programs at the local government or non-profit level.

Interviewees were asked what types of stakeholder groups their organization's programming targets. The most frequently mentioned types of stakeholder groups were self-identified or motivated individuals or groups who were interested in planting trees, such as volunteers. Interviewee #18 said that many stakeholders "*just kind of fall in our laps*" because they are contacted first by people or organization who want to get involved in urban forestry. Other frequently mentioned stakeholder groups were schools, residents, local government (although some stakeholders also engage other levels of government), for-profit organizations (banks, businesses, foundations, hospitals etc.), green industry (tree nurseries), local citizens groups and others.

Stakeholder Analysis

Interviewees discussed strategies for conducting instrumental and normative stakeholder analysis (Table 2.8). First, interviewee results about strategies used in the instrumental approach will be discussed, followed by the normative approach.

Table 2.8: Sub-themes (code families), codes (bulleted) and number of quotations per code for the theme “Stakeholder Analysis.” Four sub-themes related to instrumental stakeholder analysis. One sub-theme was normative stakeholder analysis.

| | Number of Quotations |
|--|----------------------|
| <i>Instrumental Stakeholder Analysis</i> | |
| Meeting with stakeholders | 22 |
| • Neighborhood meetings | 6 |
| • Face to face meetings | 6 |
| • Importance of listening | 5 |
| • Practitioner meetings | 4 |
| • Meeting with community groups | 1 |
| Understanding attitudes, interests, needs | 6 |
| • Conducting a survey | 3 |
| • Understanding attitudes toward trees | 2 |
| • Assessing their financial situation | 1 |
| Criteria for identifying stakeholders | 5 |
| • Whoever is in the neighborhood | 1 |
| • Sphere of influence | 1 |
| • Has space to plant trees | 1 |
| • Anyone with a facility | 1 |
| • Large percentage of population | 1 |
| Assessing community capacity | 5 |
| • Cost-benefit analysis | 3 |
| • GIS mapping | 1 |
| • Exploring the neighborhood | 1 |
| <i>Normative Stakeholder Analysis</i> | 6 |
| • Permission to plant trees from homeowners | 3 |
| • Involving community in planting decisions | 3 |

The Instrumental Approach

Practitioners discussed meeting with stakeholders, most often by attending neighborhood council or block association meetings that represent specific communities. For example,

Interviewee #3 said *“a lot of its going out and just talking to people, just going into community meetings. For years, I’ve spent my evenings at different community meetings...”* Interviewee #14 discussed meeting with community groups, such as the local Rotary club. Interviewee #11 described the purpose of reaching out to and meeting with stakeholders was to ask, *“what is it that you’d like to do, what are your strengths, what are your interests?”*

Many practitioners discussed having personal, face-to-face interactions with stakeholders and emphasized the importance of listening to the stakeholders during these meetings.

Interviewee #13 said that his organization tries to meet with neighborhood leaders to tap into their networks within the communities. Interviewee #8, a university extension professor, said that he’s learned throughout his career that having one on one conversations with other urban forestry professionals has been an effective way to learn about this stakeholder groups’ capacity to implement the information he presents to them. Interviewee #6 described his approach for personally meeting with stakeholders at coffee shops or in conversations over the phone to understand their needs, as well as repeated the importance of listening:

“But if you don’t sit and listen to what it is that they’re interested in and what it is that they need, you can easily feed them too much information that they quickly become uninterested in what you can provide them. I think it’s, typically for me it’s based on individual conversations to understand what it is that they want and need.”

Interviewee #15 said:

“But if you just listen to people for a little bit and if you just understand what their concerns are, and you don’t come in as ‘I’m trying to push this tree agenda,’ you come in as ‘I’m interested in what your concerns are.’”

The purpose of meeting (and listening) to stakeholders through these meetings was to better understand their attitudes, interests and needs related to urban forestry. Interviewee #6 discussed conducting a survey by using his professional network of contacts to find stakeholders

to survey; he emphasized the importance of making the survey easy to fill out.

Interviewee #7's organization (a state agency) had created a communications plan that identified the sphere of influence for different stakeholder groups. Among many stakeholders identified in the plan, she described "environmental changers" as different levels of government and voters. "Developers" were a target audience for "environmental changers," and the "influencers" for the developers were groups like homebuyers, builders and realtors. The "messengers" are advocacy groups, which she described as *"like the Garden Club; those ladies will just take your message anywhere. They know how to reach people; they know who to talk to."* Other interviewees discussed less formal criteria for identifying their stakeholder groups. For example, Interviewee #2 said stakeholders are anybody (specifically non-profits) that has a facility to host programs. Interviewee #3 said that his organization had recently begun engaging schools because they realized there is a lot of space to plant trees on school grounds. Interviewee #5's organization engages apartment building tenants because they make up a large percentage of the population in his city. Lastly, Interviewee #19 said that his organization engages mostly businesses because there are few residential properties in the neighborhood where his organization operates.

Several interviewees discussed conducting a community assessment of ecological and social resources before their program begins targeting that area. Interviewee #14's organization first conducts an ecological assessment of natural areas within the city and categorizes these areas based on a cost-benefit analysis of the amount of restoration and maintenance work needed. She describes the next steps:

"So we sort of call it a community capacity and a civic capacity: the government, the people that are working the city, how many staff do they have, what do their budgets look like, what type of funding sources do they have, what are they currently doing in their

natural areas, what kind of groups are already working there...And then we also look at the community side of what existing community groups are already there, are there people that are already taking an active role in their parks, what kind of businesses exist there, what kind of volunteer base is there..."

She goes on to explain that the community and civic capacity assessments are combined with the ecological assessment to identify the areas the organization should prioritize. These areas tend to be parts of the city that do not have the resources or support to plant trees and conduct ecological restoration. Likewise, Interview #1's organization works with a local university to create GIS maps for a similar assessment:

"...we looked at nine variables ranging from low tree canopy, high impervious surfaces, high residential zoning and density, automotive emissions, pediatric asthma, high crime, that type of thing. So we're looking at social and environmental factors that we then have a map that kind of lets us know strategically which areas need trees the most."

Whereas Interviewees #14 and #1 conduct formal assessments of community areas that they will potentially target, Interviewee #20's organization explores the neighborhoods in a less formal fashion. He describes that someone in his organization "... just kind of [goes] out there and they just kind of get to know the law of the land and they get to know more and more people."

The Normative Approach

Interviewees discussed normative stakeholder analysis in the context of tree planting. Three interviewees described how they directly involve stakeholders (primarily residents and homeowners) in the decision to plant trees outside of their property by obtaining permission from the homeowner for tree plantings. Interviewee #5 explained the benefit of getting this permission

from homeowners when he said “*one of the nice things about that is that there is a specific homeowner in a person who is invested in every tree that we plant.*” Two interviewees emphasized the importance of involving the whole community in tree planting decisions. Interviewee #2 described the importance asking the neighborhood what species of trees they want planted:

“What doesn’t work is if you go into a neighborhood and say hey we want to plant these street trees and we’re going to plant oaks. Well maybe they don’t want oaks. Maybe they want pecans or maples and once you start trying to force stuff on people you really, it really doesn’t work. But if you gain consensus ahead of time, then it really works out well.”

Likewise, interviewee #11 described involving the community in planning for tree plantings. She said that her organization is “*enabling community members, sort of rather than a top-down kind of “we’re going to come into your community and plant trees because this is the right thing to do,” we’re sort of asking folks “where would you like to see trees planted in your community?”*”

Communication

Interviewees discussed how they communicate to stakeholders, including how they develop their messaging, the content of the messages communicated to specific stakeholder groups, the mode of communication they use to spread their messages and communication challenges (Table 2.9).

Table 2.9: Sub-themes (code families), codes (bulleted) and number of quotations per code in the approach “Communication.”

| | Quotations |
|---|-------------------|
| Planning messages | 11 |
| • Conducting consumer marketing research | 5 |
| • Constantly testing messages | 3 |
| • Having a communications plan | 3 |
| Messages for specific stakeholder groups* | 43 |
| • Communities in general | 16 |
| • Businesses | 11 |
| • Government | 5 |
| • Affluent communities | 4 |
| • Low-income communities | 4 |
| • Property owners | 3 |
| Content of Messages* | 16 |
| • Tree benefits | 11 |
| • Messages not to use | 5 |
| Mode of Communication* | 81 |
| • Personal conversations | 20 |
| • Print media | 18 |
| • Online media (e.g. websites) | 12 |
| • Giving away free materials (e.g. coupons) | 9 |
| • Facebook | 6 |
| • Visual signage | 6 |
| • Attending events (e.g. tabling) | 5 |
| • GIS data/maps | 3 |
| • Radio, DVDs | 2 |
| Communication Challenges | 33 |
| • Engaging new audiences | 9 |
| • Ignorance and apathy toward trees | 6 |
| • Lack of knowledge about tree benefits | 6 |
| • Conveying importance of trees | 5 |
| • Language barriers | 3 |
| • People’s dislike for trees | 3 |
| • Lack of knowledge about urban forestry programs | 1 |

Planning messages to use for stakeholder audiences seems to occur after or during instrumental stakeholder analysis. Many of the organizations conduct consumer-marketing research to develop messages for target audiences. One non-profit, one local government agency and two state level practitioners reported hiring public relations firms or consultants to conduct this

research. Interviewee #5 described a less formal strategy used by their organization to test messages with different audiences:

“...each time we go to a neighborhood, we’ll test messages with different door-hangers that we give out. And so we’ll experiment with them. So I guess it’s not totally informal, we’ll experiment with a different message and then we’ll see a total number of forms for trees came out of that campaign. So it’s been kind of a mix of anecdotal and a test.”

Other interviewees emphasized the importance of having a plan for communication with different audiences and having a menu of messages prepared before communications are targeted. Interviewee #20 talked about how some audiences may not be ready to hear certain messages, such as about the environmental benefits of trees. Similarly, Interviewee #12 described that even though his organization has worked to educate residents about how trees improve water quality, *“...I think what we’re realizing is that we need to connect the people at where they are, and where they are is that ‘trees are pretty.’”* Thus, his organization has learned to develop messages that relate to people and that they can understand

Messages for Specific Stakeholder Groups

Interviewees described how they develop and implement messages for specific stakeholder groups, thereby tailoring their message and its content to each audience. As interviewee #10 explained, *“If you’re doing a good job, you should tailor it towards every single group.”* Interviewees discussed how messages for affluent communities deal with neighborhood and property improvement. Business, developer and funder-targeted messages are focused on public relations and sustainable development. Messages for communities in general revolve around the ways that trees can improve the neighborhood and how tree plantings are a way for neighbors to gather together and socialize. Government specific messages focused on the ways

that trees can be a good investment for address multiple issues with a city, from reducing crime to saving costs.

The content of some of the messages used for specific groups were overlapping, in that the messages across all groups focused on the benefits of trees. For example, many interviewees discussed messaging about how trees can increase public safety because researchers have associated trees with lower crime rates (see Kuo et al. 1998). Three practitioners mentioned how one area of benefits that trees provide can be the entre (or “gateway drug” according to Interviewee #20) into another area of benefits provided by trees. As interviewee #15 explained, *“... if you can just figure out what somebody is interested in, it’s likely that trees have some relation to what their concerns are.”*

In general, messages used across stakeholder groups focused on the benefits of trees that would be relevant for each audience. Interviewee #8 said he has learned to make his messages about management practices practical for other practitioners and to not “*present recommendations in a way that just could never happen in the real world.*” Three interviewees discussed that they try to use simple, non-technical language about trees and not “*engineering, planning or non-profit speak*” (Interviewee #9). Several interviewees shared the types of messages that they have found ineffective with certain audiences, which tended to focus on the natural environment. Interviewee #5 had observed that low-income neighborhoods associated “greening” messages with gentrification, so his organization began messaging about nostalgia and “*putting down roots*” instead. Interviewee #11 shared his observation about environmental messages being ineffective in some areas:

“...we certainly find that some communities respond to different messages in different ways. Some communities, we can go out with the storm water message and the benefits of trees message, and that message really resonates with residents. In other communities,

we may as well be speaking Greek. It's really not a meaningful message."

Mode of Communication

Practitioners are utilizing multiple modes of communication, including print media (brochures, newspaper articles, etc.), online media (websites, blogs, email list-serves) and giving away free promotional materials about their organization, such as coupons for buying trees. The most frequently discussed mode of communication was personal conversations. Interviewees explained that they often relied upon word of mouth people in the community to spread the word about their programs. Several interviewees mentioned that the word of mouth process begins with them attending meetings to talk about their programs or speaking with other urban forestry practitioners. Interviewee #1 explained this process:

"So, getting out to neighborhood association meetings and talking about our program...somewhat knocking on doors in the sense of telling, going out to these different meetings, what we do. That's probably, almost a building block. I think it's face to face communication and then it's the ripple effect, that word of mouth"

He goes on to identify the ripple effect as spreading word of mouth about the program to other groups and neighborhoods. Interviewee #15 talked about starting the word of mouth process with program participants. She said: *"...what we want to do is go back to the people who were in the program the first year and leverage those people and get those people to go out and talk to their neighbors and their friends and get them involved in the program for this year.*

Interviewee #20 discussed how word of mouth sometimes happens organically:

"So we actually started up a tree planting type campus like tree planting program with those parents through this [program]. Then those parents somehow knew parents at another nearby school and we've actually gotten into seven different schools in [another neighborhood] just through word of mouth through those PTA groups. So it's that organic at times."

Personal conversations seem to happen after the practitioner has gathered information and learned about the stakeholders during stakeholder analysis. Interviewee #2 described how he introduces his organization to members while speaking at community meetings:

“...we’ll go straight to the civic associations and I meet with them two or three times a week because there are hundreds and hundreds of them around [the city] and I go straight to them and say ‘you guys figure out what species you want and how many you want and if you water them, I will give you the trees.’”

Several practitioners discussed canvassing as a way to have personal conversations with stakeholders (primarily residents and homeowners) and to ask them if they want to have trees planted. Interviewee #11 said that canvassing is being used by her agency to help get enough residents signed up to plant 5,000 trees. She explained “...our canvassers, actually go door to door and talk with property owners and basically convince them that they really are interested in tree planting.” Interviewee #3 says that his organization uses AmeriCorps volunteers to conduct canvassing in a similar way:

“And what we’ll do is have them canvass the neighborhoods surrounding our large plantings with hang tags or flyers or like postcards and they’ll just go door to door knocking and saying ‘hey, do you want trees in your neighborhood. If you want a new tree we can either come drop it off, or we’ll be over on this block if you want to pick it up or if you want help.’”

Interviewee #18 attested to the success of canvassing efforts by her organization:

“...We found that we are much more successful in canvassing for people to have a tree planted if we are doing it face to face, door to door, with door hangers, ringing doorbells than if we do blanket mailing...we do a target mailing directly to those homes, but by far, the canvassing pays off way better.”

Interviewee’s #5 and #2 also discussed using door hangers during canvassing to inform residents

about tree planting programs. Interview #11 believes that personal communication by canvassers can be a successful way to engage stakeholders:

“So you go, you show up at the door and you have a conversation, now they’re thinking about [planting a tree]. Even if they said no, they’re thinking about it and maybe they’ll be more tuned in to the importance, to other stories they may hear about tree planting, people’s investments in trees and that sort of thing.”

Interviewee #12 shared that having neighbors canvass their neighbors is more effective than having a canvasser from city government. He said:

“If someone comes to your door and says ‘I’m with the city...’ that’s different than if someone comes from your door and says, ‘I live around the corner. Do you want to get trees?’”

Interviewee #5 explained his opinion that residents know how to communicate best about trees to other residents:

“But our main driving principle is that it’s always going to be more effective to have someone in the neighborhood to try to convince just a random person in a house to put a tree in front of their house than me doing it.”

Some interviewees discussed the importance of timing communication in neighborhoods before urban forestry activities begin. Interviewee #8 discussed sending brochures to residents about utility forestry (planting and pruning trees in areas where there are electrical wires) as a good way to inform the community about upcoming pruning activities by utility foresters. After some residents complained about not being informed about tree planting projects in the past, Interviewee #3 discussed the importance of informing the community before a tree-planting project. He explains:

“What we typically...do before planting, whether its a street tree planting or a planting in a park or at a school, we like to get the community involved first...like if were planting at a school, we don’t like to just have the school, we like to have the community involved as well so that no one’s surprised... we try to get

everyone informed the best that we can before the day we do the plantings.”

Communication Challenges

Several interviewees discussed communication challenges. The most frequently mentioned challenge was engaging new audiences. Many government and non-profit sector urban forestry practitioners felt as if they have been successful in engaging the audiences that are easiest to reach, but are having trouble reaching out to new audiences that they have not yet engaged. In the context of extension outreach, Interviewee #8 said that he has had trouble reaching out to other urban forestry professionals who *“don’t read professional materials, they don’t read applied scientific materials, they don’t read fact sheets or brochures; they don’t cruise around on the internet and try to improve themselves professionally.”* Interviewee #6 (a state urban forester) discussed the obstacle of reaching new audiences who are more interested in air and water quality issues and who have not “tuned into” urban forestry issues in the past.

The challenge of engaging new audiences was discussed most frequently by interviewee’s working in the local government and non-profit sectors. This issue was discussed in the context of the language barriers that exist between their organization and the greater community. Two interviewees talked about translating some of their outreach materials into other languages. However, other interviewees are not able to translate their materials into other languages, leading to language barriers that prevent their organization from reaching certain communities. Interviewee #15 explained this challenge in light of her city’s goal to plant 200,000 trees on single-family residential properties in the next 25 years. She explains:

“Like I said, right now we are reaching the people that are easiest to reach...The first [trees] are going to be the easiest because the first ones are going to be people who like trees and who speak English and who have space. But as time goes on, we’re going to

need to reach more and more of the people who are harder to reach, people who aren't quite convinced about wanting a tree and the non-English speaking communities, just because I don't speak another language, so we need to find ways to work with those communities. And I think there are a lot of challenges we haven't seen yet."

Interviewee #11 described a similar challenge in her city:

"There are some communities where we have non-native speakers and we do not have, we are predominately English speakers here in [my department]. And when we go out to do outreach and if you knock on the door and the person who opens it speaks Russian, we are sort of at a loss. We can't have that conversation. Even if we could say 'hello, would you like to plant a tree?' we couldn't have the rest of the conversation. So that's sort of something we have not figured out how to surmount."

Interviewee #20's organization has also experienced the same problem in his city.

"...we for the longest time as an organization survived off of a social effect that we call the popcorn effect. We were doing work in certain areas of the city...and people nearby that one activity would heat up and want to also do our work...And so we were hoping well ok [we'll] just grow throughout the region through the popcorn effect, but we realized that there are these social barriers that are basically walling off certain communities. And so we recognized that we cant just hope that the popcorn effect gets us into parts of [the city] that actually have the lowest canopy coverage, have lots of socially impactful circumstances."

Although Interviewee #20 did not elaborate on the specific social barriers that walled off certain communities, other interviewee's did. Interviewee #16 identified low-income neighborhoods and areas with a high number of rental properties as social barriers that have been challenging for her organization to overcome. Interviewee #15 also reported that her organization was facing obstacles engaging residents in multi-family condominiums and apartments because, in her city, people who want trees planted must first get permission from the property owner or their landlord which can be difficult to do. Interviewee #15 expressed that she would like to figure out how to engage hard-to-reach audiences, but that they have *"just sort of*

started with the low hanging fruit and then try to address these down the road.” Interviewee #14 also alluded to this challenge when she said *“we also feel like after we’ve picked all the low-hanging fruit, how do you work with groups that are a whole population that we don’t even know how to connect with yet?”* As demonstrated by these interviewees’ comments, the existing communication strategies are not reaching large populations in their communities, and practitioners are struggling with how to engage hard-to-reach audiences (high-hanging fruit).

Interviewees also discussed other communication challenges. Two interviewees described the difficulty in having their tree messages compete with messages about other issues that people find important. Interviewee #17 said that they are *“competing for attention with everything else going on the world...people don’t wake up in the morning thinking about urban forests.”* Interviewee #3 described the challenges associated with helping residents to see the positive benefits of trees after they have experienced the negative aspects of tree plantings:

“So its kind of like, its fighting off these untrue fears I guess, its just the beliefs that citizens have [about trees] that aren’t true...And then not only disproving their beliefs about trees, but to also throw in the fact that there are actual benefits of trees. Not all, but most citizens who don’t know about the benefits of trees, only have a dislike for trees because they think that they only cause problems. So I have to prove to them how they don’t cause problems and they also add benefits...”

Interviewee #6 wants to be better able to communicate to people who don’t hold a strong affection for trees. He said, *“...while we’re all tree lovers, we get it, we need to learn how to speak to the non-tree-lovers as to what is it we want to do.”*

Education

All interviewees are involved in educational activities for tree planting and stewardship. Many of these organizations host community tree planting projects in which anyone can

volunteer to plant trees, usually on a day during the weekend. Some of these planting days are conducted with community groups or with businesses. These types of events serve as a way for participants to be involved in tree planting and to learn about urban forestry. Interviewee #3 describes the type of education he facilitates during these programs:

“If we’re doing a planting, typically there’s a nice little educational piece while we’re planting trees I’ll walk around and discuss what the benefits of the trees are. And have them by the end of the time, list to me what the benefits are and what their favorite part of a tree is kind of thing.”

Similarly, Interviewee #12 describes the learning outcomes of these programs for homeowners:

“...it’s very common that the homeowners say, ‘Wow I didn’t realize there was this much to planting trees. I didn’t realize that you had to break up the outer roots. I didn’t realize that you were supposed to find the top root and not just plant it at the level it was in at the nursery,’ or things like that. So people are getting a lot of understanding about how to plant trees and how to make them more healthy.”

A second model for neighborhood tree planting programs shared across seven of the practitioners’ organizations entails tree-planting projects that are almost entirely community-driven. Several interviewees described how these projects begin when residents (sometimes individuals, sometimes groups) contact the organization to express their interest in planting trees in their neighborhood, and then the organization works with the residents to train them to coordinate and organize these activities in their own neighborhoods. Interviewee #1 summarizes this program model:

“Kind of works that neighborhoods apply to us for trees. We’ll go out to meet with the neighbors, walk the site, look at which species would be appropriate. We’ll then ask the neighborhood to bring out volunteers. We’ll also provide volunteers as a good number of people volunteer with us every year. We’ll go out on often times a Saturday and plant those trees with neighbors.”

In addition to these types of programs, many of the interviewees provide stewardship training programs. These trainings vary in length and duration. Interviewee #13's organization has a 12-hour pruning course, but they also offer shorter pruning and stewardship workshops on Saturday mornings for people who can't commit to the longer program. Interviewee #20's organization has a training program for volunteers that requires 4 to 6 months to complete and Interviewee #11's program entails between 5 to 8 sessions that are anywhere between 2 to 6 hours. Participants in many of these programs receive badges or certificates and are designated a title such as a "neighborhood tree steward."

Many of the organizations that have free or subsidized tree programs require that tree recipients complete a short training course about proper tree planting and tree stewardship techniques. Some of the organizations that do not provide trainings will provide written materials about tree planting and stewardship. Despite efforts to educate stakeholders about stewardship, many interviewees identified that a major barrier to tree planting was residents' fear of the problems caused by trees and not wanting to take responsibility for maintaining trees.

Interviewee #12 summarized this challenge:

"The biggest challenge is fear of maintenance...if we can't convince someone, it's usually related to, 'At one point in the past I had a tree that broke my sidewalk. And then I had to pay a thousand dollars to fix it, and I cut down the tree and I never want a tree again.' Or, 'The leaves are going to fall out of the tree and I'm going to have to rake them, and I don't have the time to do that.' Or, 'The tree is going to fall down on my house and kill me.' ...people are opposed to trees for maintenance reasons."

Other interviewees noted how difficult it is for them to understand and accept that not everyone likes trees as much as they do. Interviewee #5 describes his reaction:

"Maybe this was just me being overly optimistic, but I thought who doesn't like trees? Trees are such a universally liked thing. Trees, everybody should want these. It's just the number of people you

talk to who just are not interested and just say 'no I just don't want that.' And you say 'oh come on, it's so helpful to the block, it helps make it look better.' And they just aren't even interested."

Empowerment

Core Activities and Leadership

Core activities serve as vehicles for the development of self-efficacy and skills among the group participants. Tree planting and stewardship programs function as the core activities for developing self-efficacy in participants and volunteers. Interviewee #13 works in an organization that modeled their tree planting activities on green jobs programs. He describes how his program enhances self-efficacy for participants who receive training in tree-climbing:

"So the good thing about that course is it prepares people obviously to go into tree climbing and tree care, but it's also for people that maybe discover that this isn't something they want to do, but just the accomplishment of going 60 feet up in a tree changes their perception of what they can do, especially if they're coming from a welfare-to-work program or are under-employed."

This quotation demonstrates how program participants are learning technical skills related to urban forestry, but also gaining the self-efficacy they may need to pursue employment. Practitioners also discussed the organizational processes through which they attempt to empower participants in the context of educational tree planting and stewardship programs. For example, Interviewee #20 described having multiple ways that people can be involved in their programming (opportunity role structure):

"So there are many different types of people in [the city] and we would like all of them to feel like they can make a positive change no matter what their circumstances are. So we try to have a variety of opportunities to get people involved."

Interviewee #11 offered a unique example of how her organization provides a variety of

ways for volunteers to become involved in urban forestry other than planting trees:

“One of our tree stewards is a photographer. So he took a bunch of folks out and he took a bunch of pictures. Then, we had a frame shop donate frames and matting and we printed the pictures, framed them up. And then last Friday, we had an art gallery, an art show, for one of the local neighborhoods and sold pictures to get money for their tree team.”

Several practitioners described the types of training programs that are available for committed volunteers beyond tree-planting events. These training programs serve as the vehicle through which participants develop leadership skills to become advocates for tree planting and stewardship in their community and typically draw highly dedicated volunteers. These volunteers generally identify themselves to the organizations and are often asked to recruit their fellow neighbors to also volunteer to plant and care for trees. In Interviewee #16’s program, a small group of residents who are interested in tree planting go through a training course and will then be “certified” as the local tree experts for their neighborhood. She explains that the purpose of this program is *“so if somebody calls us and says they’re interested in planting a tree or they’re having a problem with the tree, we can tell them what group [of trained local volunteers] they can call in their neighborhood.”* Interviewee #16 also described providing community organizing training to these groups of volunteers:

“And what we do is we train people and invite them to go home and figure out what they want to do in their neighborhoods and then call us to help them with their work day. And it’s a subtle difference, but it’s huge. And so what we’re finding is that we’re empowering groups not only to do training stuff with tree planting, but also to organize their neighborhoods.”

She explained that the purpose of these trainings was to make the groups self-sufficient, and she went on to provide evidence of this outcome. She reported: *“And so we’ve seen civic associations pop up and come back as a result of it [the volunteer leadership training*

program].” Interviewee #20 also described training volunteers in both urban forestry and non-tree related skills: “*We train groups in the steps that it takes to plant trees, and then we support them in those steps, permitting, tree selection, community organizing, soliciting support from businesses, organizing a planting day and most importantly in our opinion building a tree care plan.*” Like interviewee #16, Interviewee #20 believed that the purpose of providing volunteers with non-tree related skills was to enable them to independently take all of the steps necessary to get trees planted and maintained in their own neighborhood.

In other organizations, volunteers are asked to plan and conduct a project in their community after they have received training. Interviewee #11 described this feature in their training program:

“...then your capstone for that is to do a project in your community, which can be organizing a tree planting. It can be organizing a tree walk, tree pruning. You know some sort of advocacy, whatever it is that you would like to do for your community.”

Interviewee #5 shared a similar program model. He explains that after a group of residents expresses interest in urban forestry to his organization, he asks one of them to host a meeting at their house and educators from his organization will work with the residents to strategize how they will convince their neighbors to get trees planted. At these meetings, volunteers are provided with flyers and forms to sign up for trees for them to give to their neighbors. All of the volunteers will sign up to canvass a block in their neighborhood and to talk to their neighbors about tree planting. He explains that his goal is to get everyone excited about tree planting by the end of that meeting:

“...and then the whole thing is trying to keep them committed over the next few months. So as much as possible I would send out e-mails saying ‘hey we’re up to 17 people now and Jane just got a few more people signed up on her block.’ Sometimes I’ll send a

personal note and say 'hey are you going to be going to that event, it's coming up in three days, do you need anything, are you ready for it?' So it's kind of getting the neighbors to make a plan and prodding them along the way to get them to do as much as possible."

Several interviewees described the ways that groups of trained neighborhood tree stewards become leaders or advocates for stewardship in their community. Interviewee #19's organization has put volunteer monitors in place in a local neighborhood to watch over individual trees and described how stewards altered the sidewalk to give one street tree more air and water. He told a story about the impact of these actions:

"...the fact that we did that I think gave the building manager some sense of 'ok, the neighborhood seems to like this tree.' And they kind of grudgingly, I think, said 'alright, I'll put up with this.' So, a lot of it's been engaging communities, just that somebody's noticing this stuff and tracking it has its own impact. When someone's watching and noticing some things, somebody tends to act a little differently. It's hard to say where that happens all the time, but I think it does have a ripple effect."

Other interviewees discussed a similar approach to using peer-influences in the neighborhood for stewardship. Interviewee #12 explained:

"This community effort is something that the city thinks is really cool and is helpful to them because we end up with healthier trees when people buy the trees, go through a community process to plant it where their neighbor helps them plant it in their front yard. Their neighbor walks by it and sees that it's not getting water, they'll be like, 'Hey. I planted that tree in your front yard. Don't you want to water it?' Kind of like a peer pressure that we developed in this system."

Interviewee #12 goes on further to explain another program that uses peer-pressure in the neighborhood. In this program, volunteers inspect neighborhood trees and they hang tree health report cards from the branches with tips for the resident about how to take care of the tree.

Social Support

Several practitioners described how their organization fosters an atmosphere of social support by creating opportunities for social interactions. Two interviewees mentioned that their neighborhood tree planting programs include a potluck breakfast or lunch or both. Interviewee #10 encourages tree planting crew leaders to ensure social interactions among participants.

Interviewee #5 explained that at their community organizing meetings with residents:

“we always spend the first third of the meeting or so just having people in the neighborhood meet each other and say generally where in the neighborhood they are and why they’re interested in getting trees...just trying to get people to interact with each other and sort of build communal ties.”

He went on to describe that these relationships are the building blocks for sustaining participants in the program:

“...no matter what the cause is that you’re working on and no matter how much people care about that, no matter what you’re trying to do, they’re going to come out Tuesday afternoon because that’s when the other person that they met comes out to do it...I think the most important thing that I learned was the importance of really putting time, resources, energy and effort into making your cause something that builds social relationships so that they only know each other through their work [in this organization] and so you basically just piggy-back off these relationships that you build.”

Interviewee #13 talked about how his organization tries to build social relationships by hosting networking events and parties. He said:

“Sometimes we’re not teaching, we’re just mingling and having fun and drinking wine and eating and getting to meet their neighbors. So I think they feel like it’s not the organization, it’s the organization that they’re a member of, that they’re a part of.”

Critical Awareness

Recall that critical awareness of the socio-political environment is a characteristic of

individual level empowerment, in addition to self-efficacy and involvement in activities to exert control over one's life. While many of the interviewees described ways that their programs nurture self-efficacy in participants, efforts by urban forestry practitioners to foster critical awareness in individuals were mixed. Some of the practitioners described how they do not work to address some of the larger social and economic issues that are present in stakeholders' communities. Interviewee #12 touched on some of the reasons why they are not able to address these issues:

"It's a little bit of a struggle for us because then we don't have anything more for them to do once they get their trees. They can't plant more trees because their yard is now full. And they've had a little bit of this community building experience, but they don't have anything to go from there, you know, to continue and say, 'Well we do have this crime problem in our neighborhood. Now I know all my neighbors, so how am I going to get together with them to do something about it?' ... we don't do much to address the issues outside of the urban forest canopy because part of it is we are paid to plant trees... I don't think we do a lot to influence them on other issues or affect other community issues."

However, interviewee #13 alluded to the ways that their organization does address larger social issues in the community. He described how participants are concerned that their very participation in urban greening will cause negative impacts in their neighborhood:

"Then we deal with things where people are concerned in some neighborhoods also that through the process they're going to become a product of their success and their neighborhood may gentrify because they're taking this initiative and improving their neighborhood. So that's also something that you have to deal with and try to say, 'Well this is a way to get engaged and get involved, so if those are concerns of yours then you need to get involved in other things. And you can hold down your place in your community.' ... So we're talking about the economy, we're talking about education. We're talking about neighborhood revitalization along with the environment."

Interviewee #13 described neighborhood revitalization as educational advancement and

the emergent green jobs sector and emphasized that it is important to emphasize these issues in addition to the environment, especially for youth audiences.

Incentives for Tree Planting and Stewardship

Incentives are a feature of empowering organizations because they serve to reduce the cost of participating in the organization's activities. Many of the interviewees' organization use incentives (incentive management) to encourage people to participate in tree planting programs. Five interviewees' organizations have programs that give away trees for free, or that offer subsidies or rebates for trees. These programs are mainly intended for homeowners, although a few interviewees provide tree subsidies for hospitals, cemeteries and charitable organizations in the community. Many of the interviewees discussed the importance of fostering residents' ownership over the trees they receive through these types of programs by ensuring that recipients learn about the benefits of trees or selecting which species of tree they receive. Interviewee #5 explained that rather than giving away trees for free, they sell trees to homeowners using a pricing model that was set to deliberately foster residents' investments in the tree. He explains:

"They signed off for it, they paid 20% of the cost for it, which by the way a lot of the stewardship, or a big part of the pricing models that we use are based on stewardship. We used to give away trees for free and then we decided that people just weren't invested in them. And so the price point that we always pick has less to do with bottom line for the organization because we essentially have funding that will pay for all of the trees. And it has more to do with trying to find the right price point where it is something that is affordable for people but they feel like they have skin in the game."

He goes on to describe how the price they charge for the tree also includes four visits from urban forestry staff over the course of three years who will check on the health of tree.

These programs have mechanisms in place for the practitioners to maintain contact with

the tree recipients and to ensure that trees are stewarded in the long-term. For example, Interviewee #3 sends refrigerator magnets with directions for tree care. Other organizations send postcards throughout the year with seasonal reminders for tree care. Practitioners also use websites to share information about trees planted through their programs. Interviewee #7 described how her agency developed a social media type website for people to use after they planted a tree through her program. As she describes, *“You have to plant a tree in your own backyard and go online and join the [the website] and talk about your tree and your experience and what it meant to you.”* Interviewee #3’s organization created a similar website where people who have received free trees can submit a story or an update about the trees. Interviewee #5 describes how his organization recognizes the successful stewardship efforts of their program participants and celebrates older trees:

“...we track down homeowners of trees that we planted ten years ago and we started featuring them in our newsletters and communication. This is someone who planted a tree ten years ago and now they’ve got a big healthy tree and they love it. Here they are hugging their tree...And actually just now it’s our 30th anniversary and we picked five of the plantings that we did in our first year ever and we’re tracking down our 30 year trees. And we’re going to do this whole big push about ‘these are the first trees [the organization] ever planted and they’re enormous now.’”

Discussion

The interviewees described their strategies for conducting stakeholder analysis (instrumental and normative) and communicating with different stakeholder audiences, as well as the challenges they have encountered related to communication. They also described their

educational programs, many of which lead to empowerment outcomes for the participants.

Stakeholder Analysis and Communication

Gaining knowledge about stakeholders interests' during stakeholder analysis and tailoring communication to a stakeholder group is an iterative and evolving process based on the practitioners' experiences working with participants in the field. Many practitioners found that messages about the environmental benefits of trees, while successful in engaging affluent home-owning audiences, were not successful in engaging hard-to-reach stakeholders such as low-income and non English speakers. Thus, many of the messages used by practitioners emphasized topics such as human health and neighborhood improvement. These topics may be more relevant for stakeholder audiences than messages about the natural environment. However, successful messages may be dependent upon the how the message is packaged and communicated by the organization and the specific character of and issues facing stakeholder audiences in different locales. Just

Personal conversations with stakeholders were the most frequently reported mode of communication with stakeholder audiences; this strategy was used during both instrumental and normative stakeholder analysis, as well as for general communication about their programs and activities. The personal conversations that occur during stakeholder interactions (e.g. at community meetings, during canvassing in neighborhoods) seem to catalyze the "word of mouth" process that raises interest in and awareness about the organizations' programs. Practitioners reported that "word of mouth" also lead to the recruitment of participants. However, *who* is facilitating the personal conversation with stakeholders matters, especially during canvassing to ask residents if they want trees planted. Several practitioners believed that

volunteers from the neighborhood were more effective canvassers than volunteers from the government or from another neighborhood. Thus, canvassing by “insider” volunteers seems to be more effective than canvassing conducted by “outsider” volunteers.

Another obstacle to effective communication was the inability to engage non-English speaking and low-income audiences. Urban forestry practitioners and organizations all face the “low-hanging fruit problem”—they engage the audiences that are the easiest to reach (i.e. English-speaking, property owners that desire to have trees planted and that have the space to plant trees) and still struggle to engage the high-hanging fruit audiences that don’t exhibit these characteristics. It was also discussed in the context of organizing engaging audiences who were interested in tree planting through “the popcorn effect” of seeing the positive impacts of tree planting in a nearby neighborhood. Given that many stakeholder organizations seem to be engaging mostly “self-motivated” stakeholders, it is easy to imagine that many more organizations are dealing with this problem than the few that identified this challenge in this study. Practitioners were mostly engaging stakeholders who were already interested in urban forestry and who were eager to become involved. The “low-hanging fruit” phenomenon is reminiscent of the passive-receptive approach to stakeholder engagement in natural resource management (Decker et al. 2001). In this approach, managers are cognizant of stakeholder input into management decisions, but do not actively or systematically seek out the views and opinions of stakeholders (Decker et al. 2001). Several urban forestry practitioners described how people who are interested in urban tree planting just seem to “fall into their laps.” When this happens, practitioners already know that they understand the benefits of trees and that they are motivated to get involved in urban forestry activities.

It seems that practitioners have effectively marketed their organization to self-motivated

stakeholders, but many of them are struggling with how to engage low-income and non-English speaking audiences, as well as people who are not as appreciative of urban trees. As noted by a few practitioners, this “low-hanging fruit” problem presents major challenges for achieving city’s tree planting goals as well as for the organizations themselves to move away from passive-receptive approach to stakeholder engagement. As cities progress toward their tree planting goals, urban forestry practitioners will likely need to shift their engagement strategies in order to target the harder to reach audiences that they’ve struggled to engage in the past. There is evidence of this shift in New York City, where tree-planting activities have targeted low-income neighborhoods that have the highest rates of asthma in the city (MillionTreesNYC 2011). In East New York, Brooklyn, for example, the Parks Department hosted public meetings in which residents offered their concerns about tree plantings, as well as suggestions for where to plant trees and which neighborhood groups to include in the activities. The information gathered as part of these meetings were included in the final plans for tree planting (Rosen and Greenfeld 2007).

The “low-hanging fruit problem” presents significant barriers to achieving the full benefits provided by trees and stakeholder involvement in tree planting and stewardship activities. Engaging hard to reach audiences (non-English speaking, low-income, non-property owning residents) is a significant challenge for urban forestry practitioners working in non-profit organizations. Practitioners seem to recognize and embrace the potential for their tree planting and stewardship programs to build the sorts of capital that are needed to enable and empower these communities to address and improve the environmental, economic and social conditions in their neighborhoods. The issue for practitioners is how they themselves can overcome these barriers to begin educating and empowering residents (using tree planting as a vehicle) to address

those issues themselves. A first step seems to be a matter of generating sufficient interest (through effective communication) to initially get people involved in tree planting and stewardship in some way. Although personal communication, as suggested by Johnston and Shimada (2004) and practitioners in this study, may be more effective than other strategies for reaching out to these communities, personal communication can't occur if the practitioners themselves cannot speak the languages and communicate a culturally relevant message used in these neighborhoods. Partnerships with community organizations in these areas may be needed to overcome the 'low-hanging fruit' problem.

Education and Empowerment

All interviewees were involved in delivering technical assistance or education about urban forestry topics to a wide variety of stakeholder audiences. Interviewees' frequently described their tree planting activities and programs. Tree planting activities serve as opportunities for the organizations to educate stakeholder about tree planting, stewardship and urban forestry in general as well as to empower them to take action. As many interviewees described, tree planting programs aim to foster people's ownership of the trees so that they will be invested in the trees and care for them in the long-term. Many organizations provide follow-up contact to the participants in the months or even years after the initial planting day to remind them about stewardship.

Empowering organizational processes are at play in these programs. Opportunity role structure was demonstrated when practitioners described the different ways volunteers can be involved. Incentive management was used in the creation of free or subsidized tree programs, which makes planting trees accessible for property owners. A pricing structure in which

participants pay a small amount for an item (rather than receiving it for free), has been applied in health behavior interventions. For example, in the context of malaria prevention in Africa, there has been some evidence to suggest that paying higher prices for mosquito nets increases usage of the nets (Ashraf et al. 2006)

Results suggest that some urban forestry organizations are educating volunteers for action beyond tree planting and stewardship. A critical goal of environmentally oriented education activities is to foster informed, thoughtful, scientifically grounded, democratic action (Short 2010). This kind of action-competence, or the building-up of people's abilities to act on their environmental concerns, is at the heart of many environmentally oriented educational activities and programs (Jensen and Schnack 1997). Some urban forestry practitioners are nurturing action-competence by providing community organizing skills trainings to participants. These leadership skills and experiences "build-up" volunteer ability to organize volunteers and neighbors in tree planting activities in their own neighborhoods and to take action on other issues that concern them. At least one practitioner reported that civil society groups had been formed as a result of volunteers being trained in community organizing with urban forestry as the vehicle for organizing skills development.

However, interview findings also suggest that practitioners are not fully grounding volunteers and participants in the socio-political issues that are present in the communities where these programs are implemented. Critical awareness or critical consciousness of larger socio-political issues is a component of grassroots community based organizing (Freire 1974), individual level empowerment (Zimmerman 2000) and action-competence (Short 2010). The practitioners interviewed in this study are aware of the ways that tree planting and stewardship can address socio-economic and quality of life issues in urban neighborhoods. For example,

many of them cited research studies on the link between trees and reduced crime (e.g. Kuo et al. 1998; Donovan and Prestemon 2010, etc.) and these studies have informed the messaging strategies they use to convey the benefits that trees can provide to multiple stakeholder audiences. The benefits of trees are also included in the educational content of tree planting programs, but it is unclear whether urban forestry practitioners (at least in this study) are then helping volunteers and participants to further explore and address the socio-political issues that their tree planting activities are allegedly addressing.

Since so many of the practitioners in this study and in the profession of urban forestry in general, are working in partnership with local government to achieve specified tree planting goals, practitioners may be working under pressure to ensure that trees are planted for the sake of planting trees, rather than for the sake of achieving action-competence. Recall that many practitioners were working in cities where the municipality had set a tree-planting goal of a few thousand trees up to one million trees. Some practitioners may have been receiving funding for their tree planting activities and as one practitioner noted, they were being paid to plant trees and not to address issues outside of urban forestry. The socio-political context in which practitioners were working may be preventing them from focusing on maximizing the full multitude of educational and empowerment outcomes of stakeholder engagement in urban forestry.

Relationships between stakeholder engagement methods

Given that instrumental stakeholder analysis is conducted to understand different stakeholder audiences' attitudes, interests, needs related to urban forestry, this stakeholder engagement approach seems to inform communication strategies more than it does education or empowerment. However, instrumental stakeholder analysis seems to occur throughout

communication (and perhaps during education) because interviewees are constantly testing their messages as they are communicating stakeholders. Normative stakeholder analysis in the form of asking residents for permission to plant trees related to the modes of communication (personal, face-to-face communication and/or door-hangers) that were used to approach these stakeholders. Once residents agreed to participate and get a tree planted, or once they received a tree through a free or subsidized tree program, education about proper tree planting and stewardship techniques occurred through a training program or by receiving written instructions or manuals. Education is often the catalyst for empowerment because once stakeholders participate in an educational program they become exposed to the empowering processes within the organization. Interview findings suggest that the neighborhood tree planting and stewardship programs include organizational structures for empowering participants.

Conclusion

Interview findings suggest that there are far more many steps involved in stakeholder engagement than suggested in the urban forestry literature. This research provides insight into the socio-political contexts in which practitioners are implementing the engagement approaches of stakeholder analysis, communication, education and empowerment. Urban forestry practitioners often work in the context of large scale tree planting campaigns implemented by local government that dictate which neighborhoods are targeted for tree plantings. As reported by the interviewees, urban forestry practitioners and organizations have faced difficulties engaging stakeholder audiences in these areas, which tend to be low-income and non English-speaking and have a large population living in multi-family homes. Since many practitioners described a passive-receptive approach for engaging self-motivated and interested stakeholders that identify

themselves to the organization, they will likely need to shift their engagement strategies as their tree planting campaigns increasingly target audiences in challenging neighborhoods. What strategies will practitioners use to engage audiences in areas where trees haven't been planted before?

Personal interactions with stakeholders are effective strategies for instrumental stakeholder analysis and communication. Personal conversations (such as through canvassing) are also important for normative stakeholder analysis in the context of asking residents if they would like trees, but it matters who is involved in having these conversations; findings suggest that volunteers from the neighborhood are the most effective canvassers for having these conversations and possibly for also fostering leadership and empowerment. Personal conversations with stakeholder initiated by practitioners catalyze “word of mouth” that raises awareness about the program throughout the community. The interviewees in this study are mainly engaging self-motivated volunteers, a group for whom stakeholder analysis is not necessary because the organization knows they are motivated to plant and care for trees. The most dedicated volunteers in these organizations benefit from empowering processes and organizational structures (e.g. opportunity role structure, leadership, social support) that enables them to become effective advocates and leaders for stewardship in their community,

Future research should further examine the empowering processes of urban forestry organizations and the individual and community level outcomes of these processes. Do the volunteers who receive leadership training feel that they are empowered to organize their community around tree planting and stewardship? Are neighborhoods more engaged in urban forestry activities if there is a trained volunteer leader actively organizing neighbors? These avenues for future research may be of use for designing urban forestry programs and activities

that nurture community development outcomes and perhaps, sustainable urban forests.

REFERENCES

- Appelstrand, M. 2002. Participation and societal values: The challenge for lawmakers and policy practitioners. *Forest Policy and Economics* 4 (4): 281-290.
- Ashraf, N., J. Berry, and J.M. Shapiro. 2007. Can higher prices stimulate product use? Evidence from a field experiment in Zambia National Bureau of Economic Research Working Paper 13247.
- Bloniarz, D.V. and H.D.P. Ryan. 1996. The use of volunteer initiatives in conducting urban forest resource inventories. *Journal of Arboriculture* 22 (2): 75-82.
- Boyce, S.E. 2011. It takes A stewardship village: Is community-based urban tree stewardship effective? *Cities and the Environment* 3 (1): Article 3.
- Chess, C. and K. Purcell. 1999. Public participation and the environment: Do we know what works? *Environmental Science & Technology* 33 (16): 2685-2692.
- Clark, J.R., N.P. Matheny, G. Cross, and V. Wake. 1997. A model of urban forest sustainability. *Journal of Arboriculture* 23 (1): 17-30.
- Conley, A. and M.A. Moote. 2003. Evaluating collaborative natural resource management. *Society & Natural Resources* 16 (5): 371-386.
- Cotroneo, V. and H. Gerhold. 2008. Conducting a tree inventory. In *Managing Natural Resources: A Guide for Municipal Commissions*. Ed. W. Elmendorf. University Park, PA: Pennsylvania Urban and Community Forestry Program, School of Forest Resources, The Pennsylvania State University.
- Decker, D.J., T.L. Brown, and W.F. Siemer. 2001. *Human Dimensions of Wildlife Management in North America*. Bethesda, MD: The Wildlife Society.
- Donovan, G.H. and J.P. Prestemon. 2010. The effect of trees on crime in Portland, Oregon. *Environment and Behavior* Online first 09/16/2010.

- Dwyer, J.F., D.J. Nowak, and G.W. Watson. 2002. Future directions for urban forestry research in the United States. *Journal of Arboriculture* 28 (5): 231-236.
- Dwyer, J.F., E.G. McPherson, H.W. Schroeder, and R.A. Rowntree. 1992. Assessing the benefits and costs of the urban forest. *Journal of Arboriculture* 18 (5): 227-227.
- Dwyer, J.F., G.M. Childs, and D.J. Nowak. 2000. Forestry in urban and urbanizing areas of the united states; connecting people with forest in the 21st century. In *Forests and Society: The Role of Research: Sub-Plenary Sessions, Volume 1*. Ed. B. Krishnapillay, E. Soepadmo, A.H.H Wong, S. Appanah, S.W. Chik, N. Manokaran, H.L. Tong, and K.K. Choon. 21st IUFRO World Congress. Kuala Lumpur, Malaysia 7-12 August 2000. [Vienna, Austria: International Union of Forest Research Organizations]: 629-637.
- Elmendorf, W. 2008. The importance of trees and nature in community: A review of relative literature. *Arboriculture & Urban Forestry* 34 (3): 152-156.
- Elmendorf, W.F. and A.E. Luloff. 2001. Using qualitative data collection methods when planning for community forests. *Journal of Arboriculture* 27 (3): 139-151.
- Fisher, D., J. Connolly, E. Svendsen, and L. Campbell. 2010. Digging Together: Why people volunteer to help plant one million trees in New York City. Environmental Stewardship Project, White Paper #1. Center for Society and Environment, University of Maryland.
- Freire, P. 1974. *Education for Critical Consciousness*. New York, NY: Continuum.
- Frumkin, H. 2001. Beyond toxicity: Human health and the natural environment. *American Journal of Preventive Medicine* 20 (3): 234-240.
- Grese, R.E., R. Kaplan, R.L. Ryan, and J. Buxton. 2000. Psychological benefits of volunteering in stewardship programs. In *Restoring Nature: Perspectives From the Social Sciences and Humanities*. Ed. P.H. Gobster and R. Hull. Washington, DC: Island Press.
- Iles, J.K. 1998. Inclusive urban and community forestry programs: Using all of your community's cultural resources. *Journal of Arboriculture* 24 (6): 316-321.
- Janse, G. and C.C. Konijnendijk. 2007. Communication between science, policy and citizens in public participation in urban forestry--experiences from the NeighbourWoods project. *Urban Forestry & Urban Greening* 6 (1): 23-40.

- Jensen, B.B. and K. Schnack. 1997. The action competence approach in environmental education. *Environmental Education Research* 3 (2): 163-178.
- Johnston, M. and L.D. Shimada. 2004. Urban forestry in a multicultural society. *Journal of Arboriculture* 30 (3): 185-192.
- Kenney, W.A., P.J.E. van Wassenae, and A.L. Satel. 2011. Criteria and indicators for strategic urban forest planning and management. *Arboriculture & Urban Forestry* 37 (3): 108-117.
- Kuhns, M.R., H.A. Bragg, and D.J. Blahna. 2002. Involvement of women and minorities in the urban forestry profession. *Journal of Arboriculture* 28 (1): 27-34.
- Kuo, F.E. 2003. The role of arboriculture in a healthy social ecology. *Journal of Arboriculture* 29 (3): 148-155.
- Kuo, F.E., W.C. Sullivan, R.L. Coley, and L. Brunson. 1998. Fertile ground for community: Inner-City neighborhood common spaces. *American Journal of Community Psychology* 26 (6): 823-851.
- . 2001b. Environment and crime in the inner city: Does vegetation reduce crime? *Environment and Behavior* 33 (3): 343-367.
- Lipkis, A. and K. Lipkis. 1990. *The Simple Act of Planting A Tree*. Jeremy P. Tarcher, Inc.
- . Lu, J. W.T., E.S. Svendsen, L.K. Campbell, J. Greenfeld, J. Braden, K L. King, and N. Falxa-Raymond. 2010. Biological, social and urban design factors affecting youth street tree mortality in new york city. *Cities and the Environment* 3 (1): Article 1.
- Maton, K.I. 2008. Empowering community settings: Agents of individual development, community betterment, and positive social change. *American Journal of Community Psychology* 41 (1): 4-21.
- McLean, D.D. and R.R. Jensen. 2004. Community leaders and the urban forest: A model of knowledge and understanding. *Society and Natural Resources* 17 (7): 589-598.
- MillionTreesNYC. About MillionTreesNYC: Frequently Asked Questions.

<http://www.milliontreesnyc.org/html/about/faq.shtml> (accessed December 5, 2011).

Moskell, C., S. Broussard Allred, and G. Ferenz. 2010. Examining motivations and recruitment strategies for urban forestry volunteers. *Cities and the Environment* 3 (1): Article 9.

Nowak, D.J., J.R. McBride, and R.A. Beatty. 1990. Newly planted street tree growth and mortality. *Journal of Arboriculture* 16 (5): 124-129.

Patton, M.Q. 2004. *Qualitative Research & Evaluation Methods*. Thousand Oaks, Calif.: Sage.

Peterson, N.A. and M.A. Zimmerman. 2004. Beyond the individual: Toward a nomological network of organizational empowerment. *American Journal of Community Psychology* 34 (1): 129-145.

Pillemer, K., T.E. Fuller-Rowell, M.C. Reid, and N.M. Wells. 2010. Environmental volunteering and health outcomes over a 20-year period. *The Gerontologist* 50 (5): 594-602.

Pincetl, S. 2010. From the sanitary city to the sustainable city: Challenges to institutionalizing biogenic (nature's services) infrastructure. *Local Environment* 15 (1): 43-58.

Reed, M.S., A. Graves, N. Dandy, H. Posthumus, K. Hubacek, J. Morris, C. Prell, C.H. Quinn, and L.C. Stringer. 2009. Who's in and why? A typology of stakeholder analysis methods for natural resource management. *Journal of Environmental Management* 90 (5): 1933-1949.

Rosen, L. and J. Greenfeld. 2007. Greening East New York: A Community Forestry Plan. New York City Department of Parks and Recreation.

Short, P.C., 2010. Responsible environmental action: Its role and status in environmental education and environmental quality. *The Journal of Environmental Education* 41 (1): 7-21.

Sipilä, M. and L. Tyrväinen. 2005. Evaluation of collaborative urban forest planning in helsinki, finland. *Urban Forestry & Urban Greening* 4 (1): 1-12.

Sklar, F. and R.G. Ames. 1985. Staying alive: Street tree survival in the inner city. *Journal of Urban Affairs* 7 (1): 55-66.

Sommer, R., F. Learey, J. Summit, and M. Tirrell. 1994. The social benefits of resident involvement in tree planting. *Journal of Arboriculture* 20 (3): 170-175.

- Sommer, R. and C.L. Cecchetti. 1992. Street tree location and sidewalk management preferences of urban householders. *Journal of Arboriculture* 18 (4): 185-191.
- Still, D.T. and H.D. Gerhold. 1997. Motivations and task preferences of urban forestry volunteers. *Journal of Arboriculture* 23 (3): 116-129.
- Strauss, A.L. and J. Corbin. 2008. *Basics of Qualitative Research*. Los Angeles, CA: Sage Publications, Inc.
- Summit, J. and M.G. McPherson. 1998. Residential tree planting and care a study of attitudes and behavior in Sacramento, California. *Journal of Arboriculture* 24 (2): 89-96.
- Svendsen, E.S. and L.K. Campbell. 2008. Urban ecological stewardship: Understanding the structure, function and network of community-based urban land management. *Cities and the Environment* 1 (1): Article 5.
- Thompson, J.R., W.F. Elmendorf, M.H. McDonough, and L.L. Burban. 2005. Participation and conflict: Lessons learned from community forestry. *Journal of Forestry* 103 (4): 174-178.
- Tidball, K.G., M.E. Krasny, E. Svendsen, L. Campbell, and K. Helphand. 2010. Stewardship, learning, and memory in disaster resilience. *Environmental Education Research* 16 (5): 591-609.
- Westphal, L.M. 2003. Urban greening and social benefits: A study of empowerment outcomes. *Journal of Arboriculture* 29 (3): 137-147.
- Yang, J. and Z. Jinxing. 2007. The failure and success of greenbelt program in Beijing. *Urban Forestry & Urban Greening* 6 (4): 287-296.
- Young, R.F. 2011. Planting the living city. *Journal of the American Planning Association* 77 (4): 368-381.
- Zimmerman, M.A. 2006. Empowerment theory: Psychological, organizational, and community levels of analysis. In *Handbook of Community Psychology*. 1 ed. Ed. J. Rappaport and E. Seidman. New York, NY: Kluwer Academic Publishers.

CHAPTER THREE: RESIDENTS' BELIEFS TOWARD URBAN FOREST GOVERNANCE IN NEW YORK CITY

Abstract

The MillionTreesNYC (MTNYC) campaign is planting 1 million trees along streets and in parks across New York City. MTNYC is a public-private partnership between the city government and non-profit organizations in the civil society sector. In this shared governance arrangement, multiple non-state actors are engaged in governing activities that influence the urban forest. Residents and private property owners are also expected to participate in urban forest governance through stewardship actions, such as watering trees. However, not all residents will recognize themselves as responsible for stewarding trees planted on public property or they may lack the knowledge or resources to do so. Additionally, they may have different beliefs toward the governance of trees planted in parks versus those in natural areas such as parks. An understanding of residents' perception of their role with urban forest governance, and their attitudes toward trees planted in different settings, may be useful for developing strategies for community engagement in stewardship. To gain this understanding, I conducted a survey of residents in Jamaica, Queens (n=399)(street tree study site) and in Canarsie, Brooklyn (n=410)(park study site) to examine attitudes toward urban trees, beliefs toward urban forest governance, the factors that affect these beliefs, and how these attitudes and beliefs differ for park tree versus street tree settings. Results reveal that the majority of participants believed the government should be responsible for managing street and park trees and respondents did not endorse a shared governance structure. A greater number of residents in the street tree study site than in the park study site believed that a) civil society or b) a public-private governance structure should be responsible for urban tree stewardship. Implications for shared urban forest

governance are discussed, such as opportunities for direct citizen participation in urban tree planting processes.

Introduction

Campaigns to plant one million trees over the next few decades are currently underway in New York City, Los Angeles, Houston and Denver (among other cities) (Young 2011). These tree-planting initiatives will bring numerous health and environmental benefits to urban populations, such as the reduction of air pollution (Nowak et al. 2006) and lower ambient air temperatures (Akbari et al. 2001). However, these benefits can only be sustained so long as newly planted trees survive (Dwyer et al. 1992); the survival rate of newly planted young trees remains highly variable across the United States, ranging from 34.7% to 99.7% (Roman 2006). One challenge for promoting the survival of newly planted trees is that many cities have faced budget cuts for environmental management (Svendsen and Campbell 2008; Perkins 2009; Pincetl 2010a), a scenario that raises issues for the governance of urban forests.

Governance entails the activities that guide, control and manage sectors of societies (Kooiman 2003) and the arrangement and pattern of actors and institutions involved in governing activities (Ostrom 2005). Environmental governance refers to the processes, mechanisms and organizations that influence environmental actions and outcomes (Lemos and Agrawal 2006). State and local government budget cuts and reduced staffing for urban environmental management has shifted the governance of urban forests such that the civil society sector (e.g. non-profit organizations, volunteers) plays a much greater role in the planting and management of urban trees planted on public property, such as along streets and in parks and natural areas (Svendsen and Campbell 2008; Perkins 2009). In many cases, local government has entered formal public-private partnerships with civil society organizations to conduct urban forest management activities, including the implementation of ‘million-tree’ planting initiatives (Pincetl 2010b).

Public-private partnerships in ‘million-tree’ planting initiatives also expect residents and private property owners to participate in the maintenance of newly planted trees. Civil society organizations can facilitate the involvement of residents and private property owners in urban forest stewardship (e.g. watering trees) through the delivery of educational programs and the provision of volunteer opportunities (Westphal 2003; Elmendorf 2008). However, many residents may not recognize themselves as responsible for tree care, or they may lack the resources (knowledge, time, tools) to steward the trees (Pincetl 2010b). Furthermore, many residents have negative attitudes toward street trees planted along sidewalks and rights-of-way because of the problems caused by trees on or near their property, such as falling leaves and cracked sidewalks (McPherson and Ferrini 2010). Evidence from the MillionTreesNYC (MTNYC) initiative in New York City, which is implemented by a public-private partnership suggests that many residents are not receptive toward street tree plantings because of the financial and legal burden associated with tree maintenance; many residents have submitted formal complaints to local government (Rae et al. 2010). If residents are not supportive of the trees that are planted, and if they do not recognize themselves as playing a stewardship role within urban forest governance, then residents may not engage in urban forest stewardship. As numerous cities work to expand their urban forests, the role residents believe they should play, if any, within urban forest governance remains unclear.

This research is a preliminary exploration into residents’ beliefs toward urban forest governance arrangements between government, the civil society sector and residents, and whether residents believe that they share governance responsibility for urban trees. A secondary goal was to examine whether these beliefs differ for street trees and trees in parks, because many ‘million-tree’ campaigns plant trees across multiple types of land-use (Locke et al. 2010). Based

on the notion that people have different experiences with trees planted in parks (e.g. recreation) and along streets (e.g. raking leaves), I hypothesize that attitudes toward trees and governance beliefs will differ for park trees and street trees. In conducting a literature review of factors that have been shown in previous research to influence attitudes toward trees and stewardship behavior, a third goal of this study emerged to understand how these factors affect beliefs toward urban forest governance.

The research questions for the study include:

1. What are residents' beliefs toward urban forest governance, and what role, if any, do they think government, civil society and they should play in the stewardship urban trees?
2. How do previous involvement in urban forestry, attitudes toward urban trees, awareness of recent tree plantings, educational interest in urban forestry and socio-demographic characteristics shape urban forest governance beliefs?
3. How do beliefs toward urban forest governance vary, if at all, for trees planted in parks versus those along streets?

In this chapter, I first provide background on governance and its emergence within urban forestry. Second, I discuss the different roles and responsibilities that government, civil society, residents and private property owners play in sustainable urban forest management. Third, I examine the challenges posed by governance arrangements for tree planting for engaging residents and private property owners in stewardship. Fourth, I review research on individual level factors that can shape a stewardship ethic among residents. I then describe the study sites and methodology for a survey conducted in two neighborhoods in New York City (Canarsie Park in Canarsie, Brooklyn and Jamaica, Queens). Lastly, I present and discuss results in terms of their implications for stakeholder engagement in urban environmental governance.

Literature Review

Governance and Public Private Partnerships

The concept of governance dates back centuries, but scholarly inquiry into modern notions of governance arose in the United States due, in part, to changing perspectives over the role of government during the 20th century (Pierre and Peters 2000). Although government had expanded its role in society after WWII to provide public services, government came to be seen as the source of societal and economic problems by the 1980s. This ideological shift away from ‘big’ government led to new forms of governing in which markets were used to deliver public services (Pierre and Peters 2000). The management of public service organizations began to resemble management of private sector businesses that operate independently of government. There were also social change movements (e.g. consumer rights, environmental) that demanded more transparent policy-making, since public confidence in government’s effectiveness had significantly declined during the 1980s. In the next decade, public debate over the role of government emphasized that the government needed to increasingly rely on non-governmental actors to effectively provide public services (Pierre and Peters 2000).

Empirical evidence demonstrates that there are multiple public, private (market) and civil society (non-profit) actors engaged in governing activities, especially in cities and urban areas (see Swyngedouw 2005). Public, private and civil society actors can be arranged or networked in different patterns or modes for governing. Institutional arrangements for governance are characterized by the horizontal configuration of public and private actors who each share the power and authority to govern (Swyngedouw 2005). In many of these arrangements, government serves to coordinate and facilitate the network of actors involved in the arrangement (Kooiman 2003). Unlike state-based hierarchical (top-down) forms of governance, ‘governance beyond the

state' in which non-governmental actors are involved in governing is seen as more democratic and empowering because actors from the civil society sector are given a greater role in developing, administering and implementing public policies (Swyngedouw 2005). Since the public tends to view governance beyond the state as more legitimate than top-down forms of governance policy-makers have pursued new forms of governance at multiple levels of government, such as urban development corporations, ad-hoc committees and stakeholder panels (Griffin 2010; Swyngedouw 2005).

Public-private partnerships (PPP) are a governance arrangement in which local government agencies align horizontally with civil society (and sometimes businesses) to deliver public services (Swyngedouw 2005). The actors within the partnership are aligned according to their capabilities and in a manner that maintains their distinctive organizational missions, but all of the actors are mutually committed to a jointly determined and shared outcome or goal. The partners share an equal decision-making role, and they work synergistically to achieve their goal (Brinkerhoff and Brinkerhoff 2011). PPPs are different from other forms of inter-organizational relationships (e.g. contracting service out to businesses) because there is a mutual commitment to attaining a shared goal, while also maintaining organizational identity (Brinkerhoff 2002). In short, the whole partnership is greater than the sum of its organizational parts because more resources can be mobilized than would be if government, civil society or businesses were acting alone (Brinkerhoff and Brinkerhoff 2011).

Rise of Governance in Urban Forestry

During the 1970s and 1980s, the concept of collaborative natural resource management emerged in light of public disenfranchisement with top-down natural resource decision-making

approaches. Two laws passed at this time, The National Environmental Protection Act of 1979 and the National Forest Management Act of 1976, mandated increased public involvement in natural resource planning and management (see Davenport et al. 2007 for a review). Thus, collaborative natural resource management entails projects, programs or decision-making processes that utilize a participatory approach and that involve multiple groups of stakeholders (Conley and Moote 2003). Collaborative natural resource management shares the same tenants as environmental governance, such as a transparent decision-making process and the inclusiveness of multiple viewpoints and sources of knowledge surrounding a natural resource management issue (Lockwood et al. 2010).

Since the 1980s, governance arrangements have emerged within urban forest management in the United States that give the public a greater role in urban forestry activities. A 1986 survey of city foresters in 2,787 cities in the United States revealed that city budgets for tree management had decreased an average of 37% since a previous survey of city foresters in 1974 (Kielbaso et al. 1988). In the 1980s, many environmental stewardship organizations formed in major cities. More recently, an assessment of 135 stewardship organizations in the government, civil society and business sectors in six major cities in the Northeastern United States found that many of the organizations (69%) that formed in 1980 or later are still in existence today (Svendsen and Campbell 2008). This same study found that civil society organizations are playing a major role in the stewardship of urban public lands; 57% of the civil society organizations surveyed conducted stewardship activities on government owned land (Svendsen and Campbell 2008). A 2006 survey distributed to 135 cities in 36 states found that 57% of the surveyed organizations in cities formally partner with volunteer, nonprofit or community groups to support the preservation and planting of trees. Ninety-one percent of the

cities surveyed partner with civil society groups to educate residents about the benefits of trees (Mullins and Fargo 2008). These recent surveys suggest that urban forests across the United States are being managed through shared governance arrangements. However, what is still unknown is the role that urban residents play in shared urban forest governance arrangements.

Many cities are currently expanding their urban forests through ‘million-tree’ campaigns. New York, Los Angeles, Sacramento, Denver and Houston, for example, are planting one million or more trees within the next decade (Young 2011). Many of these initiatives are undertaken as PPPs between local government and non-profit organizations (Pincetl 2010a). Beyond the formal ‘million-tree’ campaign partnerships, there are numerous civil society organizations and volunteers that are involved in the urban forestry activities conducted by these campaigns and others like it. The involvement of multiple actors in tree planting and tree stewardship can lead to sustainable urban forest governance (Kenney and Fraser 2011).

Shared Responsibility for Urban Forest Management

Civil society, government, residents and private property owners have the capacity to fulfill different responsibilities in the governance of urban forests. Civil society organizations can work with government agencies to ensure that tree planting activities meet community members needs and desires for the urban forest in their community (Austin 2002; Westphal 2003). Civil society organizations and government agencies can also work together to generate interest among residents and stakeholders to participate in urban forestry activities. They can organize and host events such as neighborhood tree planting and tree care projects and art and music festivals with an urban forestry theme (Johnston and Shimada 2004). Civil society

organizations can also provide educational trainings and in tree planting and tree stewardship in order to develop residents' knowledge and skills to care for trees in their community (Elmendorf 2008). Since civil society groups at the local neighborhood level are often seen as more trustworthy than government (LeRoux 2007), these organizations may be better equipped than government agencies to form close relationships with diverse audiences and to engage them in urban forestry activities (Svendsen and Campbell 2008).

Government agencies are in the position to provide oversight for urban forest planning to ensure that trees are planted in neighborhoods that need them. In many cities, low-income neighborhoods tend to have fewer trees than affluent neighborhoods (Dai 2011). Low levels of neighborhood tree canopy have been associated with higher rates of hospitalizations for asthma among children and other respiratory ailments (Lovasi et al. 2009). Since large scale tree plantings can enhance public health, (Wells et al. 2010) some 'million-tree' campaigns have prioritized tree planting activities in neighborhoods that have the lowest urban tree canopy cover in order to maximize the health benefits that the trees can provide to urban residents (Locke et al. 2010; McPherson et. al 2008). The Geographic Information Systems (GIS) research that local government (and some high-capacity non-profit organizations) are able to accomplish provides a perspective on the urban forest that can help guide community engagement campaigns by government and civil society partners in the neighborhoods where tree planting activities are planned and implemented.

Research on the existing urban forest canopy and other urban forest planning activities can prevent the perpetuation of neighborhood disparities in the urban tree canopy. For example, a recent study by Conway et al. (2011) in Toronto, Canada found that urban tree plantings conducted by resident associations were contributing to the uneven distribution of the urban tree

canopy in the city. The author found that the resident associations operated more frequently in affluent neighborhoods, which already tend to have higher levels of urban tree canopy cover. A similar situation was documented in a case study of urban greening efforts in Milwaukee, Wisconsin (Perkins 2009). After municipal budget cuts for park management, residents in low-income neighborhoods formally (i.e. through an organization) or spontaneously volunteered to steward the parks. Resident stewardship efforts inadvertently legitimated the government's reduction of funds for environmental management by fulfilling the niche that the government previously filled at a significantly lower economic cost. Shared governance in the absence of local government can lead to incoherent, and inconsistent environmental management. This type of management regime could lead to negative impacts at the urban forest ecosystem level if trees are not being consistently and equitably stewarded across an entire city. Thus, an advantage to government coordination of tree planting activities (versus civil society acting alone) is the facilitation of tree plantings done by civil society organizations in neighborhoods that are most in need of trees (Perkins 2009).

Since urban trees are planted in areas where people live and work, residents, businesses and other property owners also play an important role in urban forest management (Kenney and Fraser 2011). The engagement of residents and private property owners in urban forestry may help to ensure that they take action to promote the health of urban trees and that they are mindful of activities that can harm the trees (Austin 2002). Unlike man-made forms of infrastructure that are located underground (e.g. utilities), trees require more frequent maintenance to ensure their survival and their provision of ecological and health services (Pincetl 2010a). For example, a newly planted street tree needs 15-20 gallons of water per week. Without adequate water, especially in the summertime, trees can easily die and stop providing beneficial ecological and

health services (Pincetl 2010a). However, budget cuts have prevented many city foresters from providing adequate care to trees (Lu et al. 2010). Thus, local government is relying on residents and private property owners to steward newly planted trees because stewardship has been found to significantly reduce the mortality rate of street trees (Lu et al. 2010; Boyce 2010). In addition to this stewardship duty, some might argue that private property owners also have a duty to plant trees on their own properties. In many cities, there may not be enough space for trees to be planted on public property and in order for a city to reach its tree planting goal, trees must be planted on private property in addition to public property (Grove et al. 2006).

Although there are responsibilities for local government, private economic, civil society and other stakeholders to fill, ensuring that all of these roles within shared urban forest governance are fulfilled is no easy task. Stakeholder engagement in the stewardship of newly planted urban trees in the absence of local government and neighborhood civil society organizations remains a significant challenge for ‘million-tree’ campaigns (Pincetl 2010b). I will examine these challenges in the context of the ‘million-tree’ campaign in New York City.

Challenges for Stakeholder Engagement in the Governing of MillionTreesNYC

In 2007, New York City Mayor Michael Bloomberg launched “PlaNYC,” a 30-year plan that encompasses 127 sustainability initiatives related to land use, water quality, transportation, energy, air quality and climate change. One of these initiatives is the MillionTreesNYC (MTNYC) project, which aims to plant one million new trees in the City by 2017. PlaNYC will also create 2,000 acres of new forest by 2030 (City of New York 2007). Tree planting activities conducted as part of MTNYC are occurring along streets, on school grounds and in natural areas of parks. MTNYC is a PPP between the Department of Parks and Recreation and the non-profit

New York Restoration Project. The Parks Department will plant 600,000 trees in public spaces (2,200 along streets, 380,000 in woodlands and natural areas of parks) and the New York Restoration Project will plant 400,000 trees. More than 500,000 trees will have been planted as of October 2011 (MillionTreesNYC 2011a).

The plan for planting 1 million trees throughout New York City was developed based on a report by Grove et al. (2006) on the existing urban tree canopy (UTC) throughout the city. In addition to mapping the existing UTC in the city, the analysis also examined possible UTC, defined as the land area that is biophysically suitable for planting trees (e.g. non-road, non-building, non-water land). The report also determined the level of potential UTC or the economic feasibility of tree planting based on the incentives that are available. It also proposed the notion of preferable UTC, defined as suitable areas for tree planting that are socially desirable based on the potential for trees to contribute to improved health and socio-economic outcomes for residents (Grove et al. 2006). Locke et al. (2010) developed a framework for measuring preferable UTC. Preferable UTC was calculated based on GIS and census data on air quality, noise pollution, biodiversity, public health (percent of population that is obese and diabetic), watersheds (e.g. flood per neighborhood land area), maximum average surface temperatures, income levels and crime rates. GIS maps of areas for preferable UTC were created that also considered criteria provided by the New York Restoration Project and the Parks Department.

Based in large part on the reports by Grove et al. (2006) and Locke et al. (2010), the Parks Department identified six neighborhoods (two in the Bronx, one in each of the other four boroughs) that had low UTC and above average rates of asthma hospitalization rates for children aged 0-14. These areas were designated as “Trees for Public Health” neighborhoods and were prioritized for tree plantings because these communities could receive the most health benefits

from the trees (Lu et al. 2009; Rae et al. 2010). In order to reach tree-planting goals for these neighborhoods, street trees have been planted in mass-block plantings, in which entire city blocks are planted with trees at once (Rae et al. 2010).

Although urban tree planting promises to beautify and enhance neighborhoods through the city, evidence suggests that many residents have not been receptive toward the trees. This presents the first challenge for stakeholder engagement in urban forest governance, which is the lack of direct stakeholder involvement in the planning and planting of trees in their communities. Tree planting decisions are largely made at the level of the PPP, in which non-profit organizations are acting as the proxies for residents. Pincetl (2010a) has observed that PPPs can sometimes patronize residents because they assume that residents and property owners will benefit from the trees when, in reality, many people will not want the trees regardless of whether they recognize or desire the services or benefits provided by the trees. Furthermore, street tree plantings require the use of heavy equipment to prepare planting beds within the sidewalk. For this reason, the city has hired contractors to plant many of the street trees. Many people have perceived these activities as an invasion of their personal territory, even though the sidewalk is public property (Rae et al. 2010). The lack of stakeholder involvement in tree planting decisions and activities has led in part to many citizens submitting complaints about the new trees to the city. Some citizens have expressed general dissatisfaction with the tree planting program and policies, expressed objections to the placement of trees and to the planting of trees based on perceptions of future maintenance responsibilities and property damages (e.g. utilities, cars) (Rae et al. 2010).

A second challenge of urban forest governance is the lack of clarity about the entities that are legally and officially responsible for the maintenance of urban trees.¹ The organization of actors within a formal PPP—in addition to the informal actors who may also be stewarding urban public lands—can create diminished accountability for the entities that are responsible for any one action or function related to urban forest management (Swyngedouw 2005). The fragmented network of all of these actors may pose difficulties for local government and property owners to coordinate management activities (Svendsen and Campbell 2008), as well as confusion among private property owners over who is responsible for damages caused to their property by trees planted on adjacent public property (Rae et al. 2010). Even though initiatives like MTNYC call upon residents to take responsibility for the newly planted trees, residents may not recognize themselves as responsible for maintaining the trees in their neighborhood that they did not plant. Since residents' did not plant the trees, they may assume that whomever planted the trees will be responsible for maintaining them. Furthermore, many residents may not want or be able to bear the economic costs associated with maintaining trees or to cover any property damages caused by the trees. The new trees have angered many residents who fear they will not be able to afford to fix potential sidewalk damages caused by uplifted tree roots (see Jaccarino 2010).

The recent evidence of citizen complaints about new trees is in line with previous research about the participation of residents in tree planting. Sommer et al. (1994) found that residents in Sacramento, CA who planted trees outside their home were more satisfied with the trees than residents who had trees planted outside of their home by a city agency. Thus, the

¹ There are blurred lines between the various entities that are responsible for tree maintenance activities in New York City (Rae et al. 2010). The city owns the spaces between the street curb and the building owner's property line, but the building owner is responsible for the maintenance of the sidewalk. When MillionTreesNYC began, the city enforced its legal authority over the sidewalk and no longer allows the building owner to deny the planting of trees outside of their property. Furthermore, contractors hired by the city to plant street trees are required to maintain and replace the trees if they die for two years following the initial planting. After this period, it is up to the property owner to maintain the tree, but whether private property owners are aware of when the two-year period ends is unclear (see Lu et al. 2010; Rae et al. 2010).

assumption made by urban forest managers that residents will be satisfied by the new trees and that they will be willing take on the maintenance responsibility for the trees planted by a “million-tree” campaign may not hold true, especially when residents were not involved in the plantings. If PPPs and other governance arrangements for urban forest management are to rely upon citizen involvement, then a significant portion of the citizenry must be engaged early in the process of planning and planting for trees to ensure that there are actors stewarding the trees throughout the urban forest ecosystem. Exploring residents’ beliefs about the entities that should be included in urban forest governance can allow for a better understanding of the role residents believe they play, if any, in urban forest management. An investigation into the primary factors that influence individual involvement in urban tree planting and tree care, is needed for the development of educational stakeholder engagement campaigns that can foster a stewardship ethic in urban residents.

Measuring Beliefs Toward Urban Forest Governance

The goal of this study is to examine residents’ beliefs toward urban forest governance arrangements between government, the civil society sector and residents. Beliefs toward urban forest governance entail residents’ judgments about the entities that should be responsible for urban tree maintenance. Previous studies have examined citizens’ preferences for public policy assignment, or their opinion about the level of government that should be responsible for public policy. Citizens form opinions about the functions performed by government and evaluate the quality of government’s performance in carrying out those functions, which then inform “solution-responsibility attribution,” defined as citizens’ opinions about the level of government that should be in charge of and responsible for public policy decisions (Arceneaux 2005).

Many studies have examined public opinion about the level of government (local, state, federal) that should have authority in certain policy areas, such as education and health care, and have found varied opinions for the level of government that people believe is best equipped to handle a policy issue (see Konisky 2011 for a review). However, Cantril and Cantril (1999) argued that surveys asking about a broad policy issue (education) are not as effective as asking about a specific issue (teacher certification) within a broader domain of public policy. Many surveys of policy preferences have not allowed respondents to choose a mixed arrangement between federal, state or local government. One of the few studies that allowed for the measurement of intergovernmental responsibility for eleven government services found that many people preferred to have a mix of federal, state and local government involved in the policy and provision of government services (Thompson and Elling 1999).

Several researchers have explored policy preferences for government to address environmental issues. Konisky et al. (2008) found that preferences for government action varied across the geographic scale (local urban areas, federally protected parks, the world's tropical rainforests) and type of environmental issue (pollution, conservation of natural and biological resources). The authors found stronger support for government action in local and national pollution issues than in natural resource management issues and stronger public support for government action to address pollution issues on a local and national scale than at the global level. Similarly, a survey conducted by Konisky (2011) found different policy preferences for environmental issues at different geographic scales. Results revealed that people preferred state government intervention to protect community drinking water, the preservation of local natural areas, and that they preferred federal government to address urban air pollution. Konisky (2011) also found that environmental policy preferences were dependent upon trust at each level of

government, as well as political ideology and party identification.

In the context of urban forestry, socio-demographics factors (age, employment status, number of children) have been found to strongly influence policy preferences for urban forest management. In a survey of residents in Alabama, Zhang et al. (2007) found that individuals who were aware of natural resource-related programs, had a family with children less than 16 years old, and were younger than 56 years old were more likely to regard the local, state and federal government as responsible for financing urban forestry initiatives than were older individuals or families without children or those with a lack of awareness about programs. Retirees were more likely than those employed full-time to believe the local or state government was responsible for urban forestry initiatives versus civil society. Non-white survey participants were more likely than whites to believe the federal government was responsible. In a more recent study, also in Alabama, Zhang and Zheng (2011) found that more people believed local government is important for funding community tree planting and tree maintenance activities than are state or federal government. While these studies provide insight into public opinion about which level of government people regard as important for urban forest management, these studies did not allow for participants to choose between a mix of local, state and federal responsibility. Survey research that provides the opportunity for participants to choose a combination of government and civil society entities is needed to fully capture people's beliefs toward urban forest governance.

Factors Influencing Beliefs Toward Urban Forest Governance

A literature review has pointed to five factors that may shape beliefs toward urban forest governance: 1) attitudes toward trees, 2) location of trees, 3) awareness of urban forest programs,

4) previous involvement in urban forestry and knowledge of trees and 5) socio-demographics.

These five factors will be further discussed in the following section.

Attitudes toward trees

Beliefs toward urban forest governance may be dependent upon people's attitudes toward urban trees. Many studies have examined attitudes toward trees, specifically the benefits they provide and the problems they cause (Schroeder and Ruffalo 1996; Lorenzo et al. 2000; Lohr et al. 2004; Gorman 2004; Heimlich et al. 2008; Allred et al. 2010). The top five benefits and negative consequences of trees in urban areas, as found in the literature, are provided in Table 3.1. Surveys have found that people rank the aesthetic and cooling benefits provided by shade more highly than the ecological services provided by trees. Improved air quality, reduced flooding, and wildlife were in general the highest-ranking reported ecological services provided by trees. In general, the problems and annoyances caused by trees are related to the maintenance of trees, such as raking leaves, and damages to sidewalks, sewers and electrical lines. Lorenzo et al. (2000) examined how attitudes toward trees influence views toward urban forest management. The authors found that people who viewed trees positively were willing to pay more for urban forest management than people who viewed trees negatively.

Attitudes toward trees also vary across different cultural groups. Fraser and Kenney (2000) found that attitudes toward trees are influenced by cultural background. In interviews with members of different cultural communities, they found that Italian and Portugese communities' valued fruit trees whereas Chinese communities valued nature paths with trees. British communities values the shade provided by trees. Attitudes toward trees and urban forest management may also depend upon the way in which members of a social group use treed areas.

Table 3.1: A comparison of the benefits and annoyances of urban trees found in recent surveys of residents. The top five benefits and categories reported by survey participants and ranked by the study authors in each study are presented.

| Author | | Schroeder and Ruffalo (1996) | Lorenzo et al. (2000) | Lohr et al. (2004) |
|--------------------------------|---|------------------------------------|---------------------------------|---|
| Study site | | Downers Grove, IL | Mandeville, LA | 112 metropolitan areas in U.S. |
| Sample size | | 662 | 3,009 | 2,004 |
| Survey type | | Mail | Mail | Phone |
| Top 5 benefits (ranked) | 1 | Visual pleasure | Aesthetic and visual | Shade and cooling effects |
| | 2 | Improved yard, house appearance | Gives shade | Calm, relaxation |
| | 3 | Brings nature close | Attract birds and wildlife | Reduction of air pollution |
| | 4 | Increased property values | Enhanced city, urban climate | Noise reduction |
| | 5 | Increased sense of community | Increase privacy | Environmentally friendly shopping areas |
| Top 5 problems (ranked) | 1 | Fallen leaves in autumn | Roots clog sewers | Allergies |
| | 2 | Fallen fruit, nuts, sticks or pods | Falling limbs | Blockage of store signs |
| | 3 | Branches growing from roots | Disease in trees | Cracked sidewalks |
| | 4 | Attracts annoying insects | Sidewalk damage caused by roots | Damage to utility lines |
| | 5 | Tree diseases | Insects in trees | Criminal behavior |

Table 3.1: (continued)

| Author | | Gorman (2004) | Heimlich et al (2008) | Allred et al. (2010) |
|------------------------------------|---|---------------------------|---------------------------------------|-------------------------------------|
| Study site | | State College, PA | Toledo, OH | South Bronx, NY |
| Sample size | | 676 | 384 | 87 |
| Survey type | | Mail | Mail | On-site |
| Top 5 benefits (ranked) | 1 | Shade | Beautification | Ability to reduce flooding |
| | 2 | Pleasing to the eye | Shade and cooling of homes | Clean the air |
| | 3 | Flowers on tree | Inviting appearance | Provide food and shelter to animals |
| | 4 | Fall color | Large size of the trees | Relaxation |
| | 5 | Neighborhood more livable | Fall color | n/a |
| Top 5 problems (ranked) | 1 | Attract animal problems | Sidewalk damage caused by roots | Drop too many leaves in autumn |
| | 2 | Insects diseases in tree | Dropped seeds and seedlings | Obstruction of views |
| | 3 | Utility line damage | Maintenance of trees on private lawns | Attract nuisance animals |
| | 4 | Sidewalk damage | Raking leaves in the fall | Poor care and neglect |
| | 5 | Branches fall | n/a | n/a |

In a study of race differences in urban park and forest participation in Atlanta, GA and Philadelphia, PA, Elmendorf et al. (2005) found that African-Americans were less likely to view urban forests as beneficial and were more likely to disagree that nature amenities were important in urban forests and parks than were Caucasians. The authors found that African-Americans were more likely to use urban parks for social activities than Whites and that Whites were more likely to recreate on nature paths within parks. These relationships held after the authors controlled for age, gender, income and level of education.

Location of Trees

A secondary goal of this study was to examine whether beliefs toward urban forest governance differs for trees planted in park and street settings. Attitudes toward trees and urban forest governance may also be dependent upon the location where trees are planted. Moskell et al. (2010) asked urban forestry volunteers to identify the environmental benefits of trees planted in parks and planted along the streets in their own neighborhoods. Findings demonstrated that while many volunteers reported that trees in each setting produce the same outcomes (e.g. aesthetic benefits, general environmental improvement, shade, clean air, habitat for wildlife), volunteers attributed these outcomes in each setting to a different degree. For example, 57% of volunteers reported that park trees produce general environmental improvement whereas 37% of volunteers reported that trees in their own neighborhood produces general environmental improvement. A similar pattern was found among volunteers' responses to a question about community benefits produced by trees in parks and in their own neighborhoods. A higher proportion of volunteers (46%) reported that trees provide community benefits in parks (e.g. community involvement in stewardship, recreation, helping MTNYC and providing education for kids), but only 16% of volunteers reported that trees provide community benefits in their own neighborhoods (e.g. recreation, neighborhood character, increased property values) (Moskell et al. 2010).

As demonstrated by previous research on attitudes toward the benefits and problems caused by trees (Table 3.1; Moskell et al. 2010), people's perceptions of trees differed between all of the research sites. People's attitudes toward trees may be dependent upon their experiences with trees in different settings. For example, park trees may be associated with recreation and ecosystem services (e.g. habitat and food for wildlife) whereas street trees may be associated

with built human infrastructure, such as the shading of residential homes. Furthermore, people may have more direct experiences with street trees planted outside of their residence due to the maintenance that these trees require; some residents may view their direct experiences with trees and their maintenance negatively (see Rae et al. 2010).

Awareness of and Involvement in Urban Forestry Programs

Awareness of urban forestry programs implemented by government can serve as the basis for opinions about government involvement in urban forest management, but researchers have found that many urban residents may not be aware of urban forestry initiatives. Schroeder and Apelt (1985) found that only 58% of residents in a mid-western town were aware of the programs and services provided by the municipal forestry department. Treiman and Gartner (2005) found that the majority of respondents in their survey in Missouri were not aware that they lived in a city that was designated as a Tree City USA by the Arbor Day Foundation, a title that is received based on a city's tree ordinance, the size of the community forestry program budget and their celebration of Arbor Day. However, a survey conducted in Alabama found that people who had an awareness of natural resource management programs (e.g. US Forest Service, the National Arbor Day Foundation, International Society of Arboriculture, the Alabama Forestry Commission, etc.) were more likely than people without this awareness to regard government as responsible for urban forest management (Zhang et al. 2007). Thus, opinions about what government entities should be responsible may be based on knowledge or awareness of current urban forestry programs.

Awareness of urban forestry programs can influence future intentions to participate in urban forestry. Straka et al. (2005) found that prior awareness of the program and participant's

age affected intentions to participate in urban and community forestry programs hosted by the South Carolina Forestry Commission. Previous involvement in urban forestry programs, like volunteer tree plantings, may also foster continued involvement in urban forestry if the program fulfills an individual's motivations to participate (Moskell et al. 2010). A recent survey of MillionTreesNYC volunteers found that one-fifth of the volunteers demonstrated a high degree of previous involvement in urban forestry activities. Types of previous involvement included membership in a local stewardship organization and previous volunteerism in tree planting and stewardship projects (Fisher et al. 2010). This study also found that volunteers tended to be Caucasian, female and well-educated and that volunteers were relatively young (median age was 30).

A citizenry that is aware of and engaged in urban forestry activities in their neighborhoods is a component of a sustainable urban forest (Kenney et al. 2011). However, one of the most difficult tasks in urban forestry is creating sufficient interest among residents in issues related to urban trees to motivate them to become involved (Johnston and Shimada 2004). Urban forestry practitioners have reported that they perceive the public to lack an awareness of urban forestry and that this lack of knowledge is a challenge for stakeholder engagement (Moskell et al. 2010). Generating an interest in urban forestry activities among residents can foster learning, a process that occurs when people interested in urban forestry move from being an observer to a full participant in activities such as tree planting (Tidball and Krasny 2011). A desire to gain basic knowledge about trees (e.g. species identification) and stewardship (e.g. monitoring for disease or invasive species, watering, pruning, etc.) may be a precursor for future involvement in urban forestry, such as in a volunteer event or in an educational workshop. A survey of residents conducted in the South Bronx neighborhood of New York City found that a

majority of participants (76%) wanted to learn more about trees; their educational interests included learning more about the human and environmental health benefits of trees, and how to plant and care for trees (Allred et al. 2010).

The Current Study

The objective of this study was to explore residents' beliefs toward urban forest governance arrangements involving the government and civil society sector, as well as whether residents see themselves as responsible, in part, for taking care of trees. A secondary objective was to understand how these governance beliefs are shaped by the independent variables 1) attitudes toward trees, 2) interest to learn about trees, 3) demographics, 4) awareness of recent planting and 5) previous involvement in urban forestry. A third objective was to compare beliefs toward urban forest governance toward trees planted along streets as well as in the natural areas of parks. Beliefs toward urban forest governance entail opinions of degree of shared responsibility between government, civil society and residents. These beliefs may be shaped by the independent variables listed in the second objective of this study (Figure 3.1).

Methods

Study Site Selection and Description

This study was conducted at two sites in New York City. One site was a neighborhood (Jamaica, Queens) and the second site was a park (Canarsie Park in Canarsie, Brooklyn). Our study sites were chosen based on three criteria: 1) vegetative cover, 2) user and community activity and 3) demographics (Table 3.2). These site selection criteria were chosen in order to identify study sites that were not devoid of trees and that encompassed trees planted in different

settings (a park versus a neighborhood) where people may interact with trees in different ways.

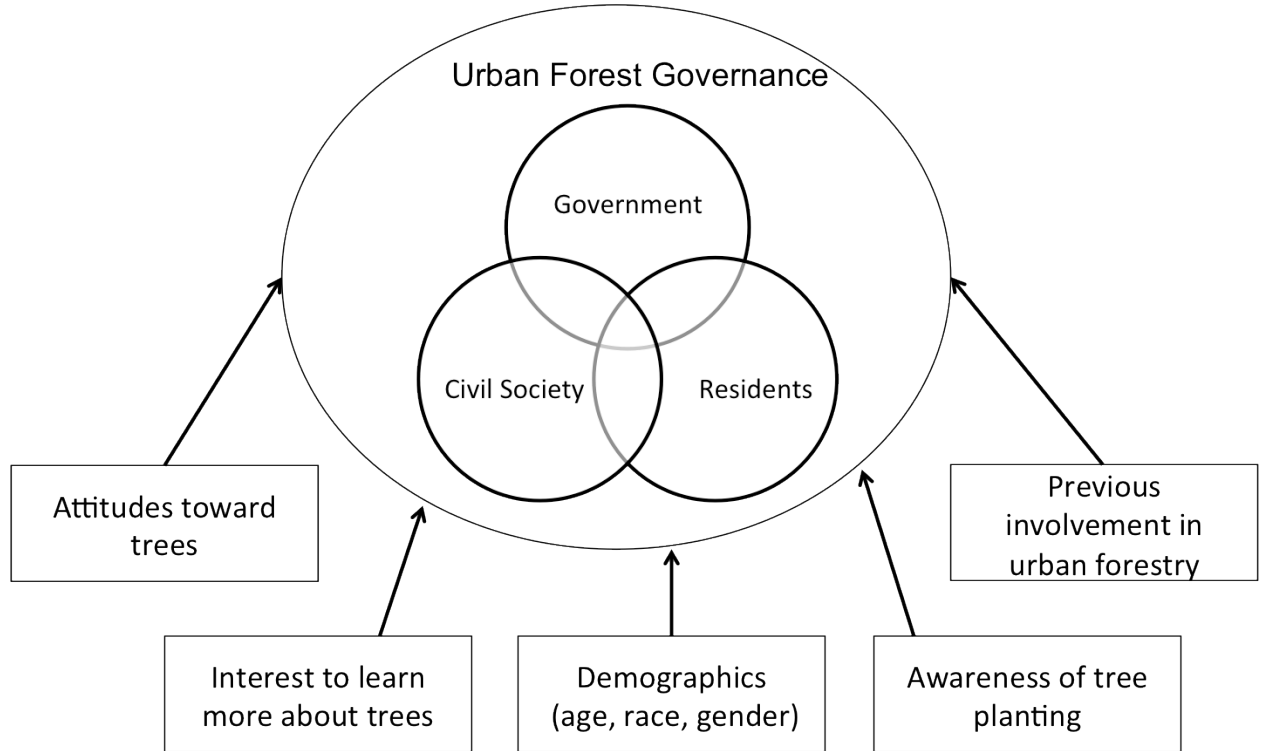


Figure 3.1: Conceptual model for the current study. The dependent variable is urban forest governance, represented here as a Venn diagram of government, civil society and residents (includes private property owners). Overlaps between these entities represents different degrees of shared responsibility for urban forest governance.

The number of stewardship organizations and the level of resident involvement in stewardship also played a factor in study site selection because I did not want to conduct the study in an area that is highly active in urban forest stewardship. The greatest density of neighborhood stewardship organizations is in Manhattan and northern Brooklyn (US Forest Service, NYC Urban Field Station 2010). Thus, I chose study sites in southeast Brooklyn (Canarsie) and in eastern Queens (Jamaica). I also considered demographics in the site selection process because I did not want to work in an affluent neighborhood because those areas tend to have more trees than lower-income neighborhoods (see Lovasi et al. 2009).

Table 3.2: Site selection criteria for the current study

| Criteria | Definition | Canarsie, Brooklyn | Jamaica, Queens |
|--|---|---|---------------------------------|
| Vegetative Cover | | | |
| Neighborhood level tree cover | Open Space (% total land use) ¹ | 38.7% | 6.5% |
| | Tree canopy cover ² | 526 acres (28%) | 201 acres (22%) |
| Planting Status | Trees planted by MTNYC since 2007 | ~ 6,800 trees in natural areas ³ | ~ 871 street trees ⁴ |
| Community Activity | | | |
| Site use by public in areas where trees were planted | Type of user activity in survey areas | Recreation (baseball, basketball, cricket, soccer, playgrounds, walking paths, nature trails) | Commercial, residential |
| Existence of stewardship organizations ⁵ | Number of registered stewardship groups | 7 | 4 |
| Resident Involvement ⁶ | Number of neighborhood volunteers who have completed a Citizen Pruner training course | 15 | 24 |
| Demographics | | | |
| Population density ⁷ | Total Population | 145,594 | 223,602 |
| | Persons per acre | 30.8 | 36.4 |
| Socio-economic status ⁸ | Median household income ⁱ | \$63,003 | \$51,353 |
| | Percent of population on income support | 25.6% | 36.0% |
| | Foreign born as percent of total population | 37.0% | 34.4% |
| Cultural Diversity ⁹ | Total population 5 years and older not proficient in English | 11.8% | 11.1% |

Sources and Notes:

1: New York City Department of Planning 2010a; 2010c

2: Grove et al. 2006

3: Canarsie-NYC Department of Parks and Recreation 2009

4: J. Kocak, personal communication, 9/1/11

5: Center for Urban Research 2011

6: S. Goberman, personal communication, July 2010

7: New York City Department of Planning 2010b

8: New York City Department of Planning 2010a; 2010c.

9: New York City Department of Planning 2010a; 2010c

i: For comparison, the New York City median household income in 2009 was \$50,033

Research site selection was also based on input I received from collaborators at the New York City Department of Parks and Recreation. These collaborators identified neighborhoods where trees were being planted as part of MTNYC that were also in need of educational programs related to urban forestry. (The findings of this study informed the development and implementation of urban forestry educational programs in the two neighborhoods). I did not use an experimental design to choose the study sites or to conduct the study. Rather, the two research sites served as cases for making basic comparisons across different types of settings where trees are planted.

In Canarsie, the research focused on trees planted in the natural areas of Canarsie Park. Between 2007 and 2009, more than 6,800 trees were planted in the natural areas of Canarsie Park (NYC Department of Parks and Recreation 2009). The Canarsie neighborhood is in Brooklyn Community District 18²; Almost 40% of the land area in the community district is zoned as open space or recreation (New York City Department of Planning 2010a). Before MTNYC began, the Canarsie neighborhood had 28% tree canopy cover, which was higher than the average 20% tree canopy cover for the borough of Brooklyn (Grove et al. 2006). In the Canarsie neighborhood (and the nearby Flatlands neighborhood) there were 3.1 asthma hospitalizations per 1,000 children aged 0-14 and 3.6 asthma hospitalizations for children aged 15-17 and adults aged 18 and over in 2007-2008 (New York City Department of Health and Mental Hygiene 2010). Thirty-seven percent of the community district's population is foreign born and roughly 40% of this population was born in Haiti and Jamaica. Twelve percent of the foreign-born population is not proficient in English; 36.8% of this population speaks French (including Patois, Cajun, French Creole) (New York City Department of Planning 2010a). The median household income for the community district (\$63,003) is higher than the median household income for the

² New York City is divided into 59 community districts.

borough of Brooklyn (\$43,166) (New York City Department of Planning 2010b). One-quarter of the community district's population is on some type of income support (New York City Department of Planning 2010a).

The research focus in Jamaica is on street trees. According to the New York City Department of Parks and Recreation, approximately 871 street trees have been planted as part of the MTNYC initiative since 2007 (J. Kocak, personal communication, 9/1/11). The Jamaica neighborhood is in Queens Community District 12. Roughly 7% of the land in the district is zoned as open space or recreation (New York City Department of Planning 2010c). Jamaica has an urban tree canopy cover of 10%, which is lower than the average 22% canopy cover for the borough of Queens (Grove et al. 2006). In the Jamaica neighborhood, there were 6.2 asthma hospitalizations per 1,000 children aged 0-14 and 4.5 asthma hospitalizations per 1,000 children aged 15-17 and adults aged 17 and over in 2007-2008 (New York City Department of Health and Mental Hygiene 2010). About one third of the population in the community district is foreign born; 22.6% of this population was born in the country Jamaica and 18% were born in Guyana. Eleven percent of the foreign born population aged 5 years or older is not proficient in English; 62.5% of this population speaks Spanish or Spanish Creole at home and 16.2% speaks French (including Patois, Cajun and French Creole) (New York City Department of Planning 2010b). The median household income for the community district (\$51,353) is slightly lower than the median household income for the borough of Queens (\$55,120) (New York City Department of Planning 2010b). Thirty-six percent of the population in the community district is on some form of income support (New York City Department of Planning 2010b).

Survey

A face-to-face on-site survey (also known as a street-intercept survey) was conducted in Canarsie and Jamaica (Miller et al. 1997). The survey was conducted over the course of 6 days in Jamaica in March 2010 and over the course of 5 days in May 2010 in Canarsie. Surveyors (N=7) included the lead author, university research assistants and Cooperative Extension educators trained in face-to-face survey methodology; 2-3 teams of partners conducted the surveys during two 1.5 hours shifts on both weekdays and weekends. In Jamaica, the survey occurred on 5 weekdays and 1 weekend day to capture the commercial and residential foot traffic. In Canarsie, the survey occurred on 3 weekdays and 2 weekend days to capture increased user activity in Canarsie Park on the weekends. Surveying occurred at three different sites within both Jamaica and Canarsie; these areas were identified because they had high levels of pedestrian traffic on the street sidewalks. Types of surveying sites included public libraries, major street intersections, train and bus stations, and shopping districts. In Canarsie, surveying also occurred at various sites within Canarsie Park, including near baseball, soccer and cricket fields, walking paths lined with benches, and playgrounds.

Survey Design

Survey questions were the same for both study sites, except that the Canarsie survey referred to trees in Canarsie Park and the Jamaica survey referred to trees along streets in the neighborhood (Appendix B). The Canarsie survey also included one question about frequency of visitation to Canarsie Park. The survey consisted of both open and closed-ended questions. Closed ended questions (yes/no) were asked about awareness toward recent tree planting, whether trees provide benefits or cause problems, previous involvement in an urban tree care

group, interest in learning more about trees and age. Open-ended questions were asked about the specific benefits and problems associated with trees, responsibility for urban tree maintenance and, if applicable, the group with whom they were involved in urban tree care. Information about respondents' race and ethnicity was also collected through an open-ended question. Respondents' gender was recorded via surveyor observation. The survey took 5 minutes, on average, to complete.

Sampling and Implementation

To recruit participants, surveyors (wearing red aprons and Cornell University polo shirts) approached passersby and asked, "Would you like to take a survey about trees?" If the person was 18 years or older, they were eligible to take the survey. We did not restrict people from participating in the survey if they lived outside of the neighborhood because we wanted to include people who may work in or visit the neighborhood or the park. Surveyors did not approach people who exhibited any of the following characteristics: a) conversing with other adults, b) talking on a cell phone, c) wearing head phones or d) walking or running in a hurried manner. We also did not approach people walking in groups because we did not want to survey one person and have group members overhear their answers before they took the survey. Thus, to avoid the threat of social desirability (or non-independence), only people walking alone (or with small children) were approached. When a person was willing and eligible to take the survey, the surveyor read aloud the questions to the participant and wrote down participant answers to the survey questions. For the open-ended questions, the surveyor sheet contained a list of potential answers to open ended questions (e.g. specific benefits of trees) that the surveyor checked if they heard those answers in the participants' response. If the respondent provided a different response

than one listed, that was noted and later coded. Survey non-respondents were tallied via hand-clickers to calculate the response rate. Two surveyors were bilingual (Spanish and English) and one surveyor was multi-lingual (Spanish, English, Russian) thus some surveys were conducted in the native tongue of the respondent per their request. Limitations to this sampling method are discussed in the conclusion of this article.

Data Analysis

Data were analyzed using The Statistical Package for the Social Sciences (SPSS) version 19. Responses to closed-ended questions were entered as categorical or nominal variables (0=no, 1=yes; 1=male, 2=female, etc.). Responses to open-ended questions (benefits of trees, problems caused by trees) were broken down into code categories (e.g. environmental benefits of trees, property damages caused by trees) and were entered as categorical variables (0=no, trees don't provide environmental benefits, 1 = yes, trees provide environmental benefits).

Responses to the open-ended question about who should be responsible for urban tree maintenance were divided into twelve codes in four non-mutually exclusive categories: government, civil society, everyone and other. Codes in the government category refer to different levels of government (i.e. local, state and federal). The code "city government" includes responses in which the individual identified a specific city agency other than the Parks Department (e.g. the Department of Sanitation, the Department of Environmental Protection, etc.), or said "the city" or "local government." Responses such as "the people who planted the trees," were coded as "tree planters." This code was included in the government category because the majority of trees in New York City are planted by a city agency, or by a commercial tree-planting firm contracted by the city (Rae et al. 2010). Thus, I assumed the people who

planted the trees were affiliated with city government.

Codes in the civil society category refer to non-governmental entities, such as residents, community groups, park users, and businesses. Responses such as “the people in the neighborhood,” or “the entire community” were coded as “community/neighborhood” and also included in the civil society category. I interpreted these responses to mean that multiple people in the neighborhood (Canarsie or Jamaica) should be responsible. Responses such as “everybody” or “all of us” were coded as “everyone.” Since “everyone” is so broad, I left this code as a standalone category as we were uncertain as to whether respondents were referring to public or private entities. I distinguished “everyone” as similar but separate from the code “community/neighborhood” because it lacks a geographic reference to the local neighborhood, but still implies that urban tree maintenance is a shared responsibility between multiple people.

Based on these responses, new variables were computed for three different governance structures: 1) government responsibility only, 2) civil society responsibility only and 3) shared responsibility. This was done to reflect Griffin’s (2010, p. 366) definition of shared responsibility for the governance of sustainability, defined as “stakeholder participation and partnership between policy levels, institutions and actors.” I conducted binary logistic regressions to determine the probability of a yes response to each of these three governance variables. For some of the regression models, age and race categories were condensed into broader categories (age 18-44, 45 or older; African-American, non-African American) when cross-tabulation tables showed a cell count less than five for any one of the three governance variables (Appendix B).

Other statistical analyses included cross-tabulations, Pearson’s Chi-Square and Phi (ϕ) to determine significant relationships and effect sizes between variables. Phi values of 0.10 were interpreted as a minimal effect size, according to Vaske et al. (2002). For cross-tabulations with a

cell count less than 5, Fisher's exact tests were calculated to determine significance. An experimental design was not used to compare differences in the independent variables between the two research sites. Thus, this analysis serves as a comparative case study because any differences or similarities between the sites cannot be attributed to an isolated influence of the research site.

Results

Socio-Demographics and Response Rate

We approached 1,388 people in Canarsie and 410 completed the survey for a response rate of 29.5%. In Jamaica, 1,357 people were approached and 399 completed the survey for a response rate of 29.4%. The overall response rate for the survey was 29.5% (N= 2,745, n= 809). Three surveys in Canarsie were conducted in Spanish. In Jamaica, 18 surveys were conducted in Spanish and 2 surveys were conducted in Russian. Survey respondents who were residents of Canarsie (n = 298) and Jamaica (n = 268) were compared to 2010 census data at the neighborhood level to assess the representativeness of respondents compared to the surrounding neighborhood. The survey sample respondents were representative for some demographic characteristics more than others (Table 3.3).

The Canarsie sample was relatively proportionate for people of Two or More Races. The Jamaica sample was relatively proportionate for White and American Indian/Alaska Native. The majority of residents in our sample in Canarsie (57.7%) and in Jamaica (40.9%) was Black/African-American, but this population was not proportionately represented when compared to the Census data (fewer African-American respondents in Canarsie and more in Jamaica). The next most frequently reported race was Some Other Race Non-Hispanic in

Canarsie (14.8%) and in Jamaica (23.9%). This demographic was significantly overrepresented in our sample. The survey question on race and ethnicity was an open-ended question and we observed that many participants identified their ethnicity rather than their race.

Table 3.3: Demographics of residents of Canarsie and Jamaica from the survey, compared to neighborhood census data.

| | Canarsie, Brooklyn | | | | Jamaica, Queens | | | |
|-------------------------------------|--------------------|-------|-------------|----------|-----------------|-------|-------------|----------|
| | Survey % | (n) | Census % | (n) | Survey % (n) | | Census % | (n) |
| Total Population^a | | | | | | | | |
| White | 10.6% | (30) | 5.9% | (4,928) | 3.1% | (8) | 3.6% | (1,949) |
| Black/African American | 57.7% | (164) | 81.0% | (67,816) | 40.9% | (106) | 22.2% | (11,946) |
| Asian/Pacific-Islander | 1.8% | (5) | 0.2% | (2,198) | 12.7% | (33) | 24.3% | (13,073) |
| American Indian /Alaska Native | 0.4% | (1) | 2.6% | (192) | 1.5% | (4) | 0.3% | (466) |
| Some Other Race | 14.8% | (42) | 0.4% | (340) | 23.9% | (62) | 5.2% | (2,814) |
| Two or More Races | 1.4% | (4) | 1.5% | (1,278) | 1.5% | (4) | 4.9% | (2,647) |
| Hispanic Origin | 13.4% | (38) | 8.3% | (6,941) | 16.2% | (42) | 38.7% | (20,790) |
| Age | | | | | | | | |
| 18-24 ^b | 10.0% | (29) | 7.7% | (6,425) | 11.6% | (30) | 8.2% | (4,408) |
| 25-44 | 40.6% | (118) | 26.7% | (22,313) | 38.0% | (98) | 31.8% | (17,095) |
| 45-64 | 34.8% | (101) | 27.7% | (23,165) | 37.2% | (96) | 23.9% | (12,844) |
| 65 years and older | 14.5% | (42) | 10.3% | (8,647) | 13.2% | (434) | 9.7% | (5,187) |
| Gender^c | | | | | | | | |
| Female | 50.7% | (147) | 57.5% | (38,752) | 47.5% | (121) | 49.8% | (21,508) |
| Male | 49.3% | (143) | 42.5% | (28,636) | 52.6% | (134) | 50.2% | (21,676) |

^a By race and mutually exclusive non-Hispanic Origin

^b Census data for the 18-24 population also contains data for the 15-17 year old population

^c Census data (in 5 year increments) for gender also contains data for the 15-17 year old population

Thus, responses that provided an ethnicity that were not of Hispanic Origin (e.g. Jamaican, Guyanese, West Indian, etc.) were coded as “Some other Race Non-Hispanic” in accordance with how such responses are coded on the Census. The third most frequently reported demographic was Hispanic in Canarsie (13.4%), which was overrepresented in the sample when compared to the census. The third most frequently reported demographic was Hispanic Origin in

Jamaica (16.2%) which was underrepresented in the sample when compared to the Census. Our sample was relatively more proportionate for people aged 18-24 and 65 years or older in both study sites. The Jamaica sample was relatively proportionate for gender.

The majority of respondents resided in the study site neighborhood in Canarsie (72.9%) and in Jamaica (67.8%); the majority of respondents who did not live in the neighborhood resided in the surrounding borough (14.0% in Brooklyn for the Canarsie sample and 19.3% in Queens for the Jamaica sample). Eleven percent of respondents in Canarsie and 21.9% of respondents in Jamaica resided in another New York City borough. Two percent of respondents in Canarsie and 4.8% in Jamaica resided outside of New York City in New York State. Less than 3% of respondents in Canarsie and Jamaica resided outside of New York State or the United States.

Factors that May Influence Shared Governance Beliefs for Park Trees and Street Trees

Based on the literature review of factors that may shape attitudes toward urban forest governance, we measured previous involvement in urban tree care, awareness of recent plantings, attitudes toward trees and an interest to learn more about trees in the future to address research questions 2 and 3.

Previous Involvement in Urban Tree Care

Only a small percentage of survey respondents had previous involvement in tree planting or tree care; 12.5% (n=50) in Canarsie, 13.1% (n=50) in Jamaica. In Jamaica, 67.3% of respondents with previous involvement were male. The calculated chi-square of 4.684 was statistically significant ($p=.030$), with gender having a small effect on previous involvement ($\phi =$

.113). Gender was not significantly associated with previous involvement in Canarsie.

Respondents with previous involvement reported a range of experiences in urban forestry. The majority of respondents with previous experience in Canarsie (11 respondents) had previous involvement as part of a school or college program, or with their children's school. The majority of respondents in Jamaica (10 respondents) with previous experience reported that they had been involved in urban forestry when they resided in another city, state or country before they moved to New York City. Six respondents in Canarsie and 2 respondents in Jamaica had previously volunteered with the New York City Parks Department, a local non-profit organization in New York City (e.g. the New York Restoration Project). Other types of experiences included participation in Boy or Girl Scouts or 4-H or having a current or former job in urban forestry or park management.

Awareness of Recent Tree Plantings

Survey participants were asked if they had recently noticed any newly planted trees in Canarsie Park or in Jamaica. Fewer than half of the respondents in Canarsie (38.0%, n=116) and in Jamaica (33.3%, n=128) had recently noticed any trees being planted in the park or neighborhood. There was a significant relationship between age and awareness of recent planting in Jamaica ($\chi^2=9.064$, $p=.028$). More people aged 45-64 (n=56, 42.5%) had noticed recently planted trees than people aged 25-44 (n=41, 33.1%), 65 years or older (n=19, 15.3%) and 18-24 years (n=8, 6.5%).

Educational Interest

Many respondents in Canarsie (n=240, 59%) and in Jamaica (n =227, 60%) were

interested in learning more about trees. There was a significant relationship between educational interest and age in both Canarsie ($\chi^2=14.135$, $df=3$, $\phi=0.188$, $p = 0.003$) and Jamaica ($\chi^2 = 15.893$, $df = 3$, $\phi=0.206$ $p = 0.001$), with age having a stronger effect on educational interest for the Jamaica sample. More people aged 25-44 in Canarsie ($n=101$, 42.6%) and in Jamaica ($n=95$, 42.4%) than people of any other age expressed an interest to learn more about trees. There was also a significant relationship between educational interest and previous involvement in each study site (Canarsie: $\chi^2= 8.083$, $\phi = 0.143$, $p = 0.004$; Jamaica: $\chi^2 = 11.134$, $\phi = .172$, $p=0.001$).

The majority of people who were interested in learning about trees in both Canarsie ($n = 198$, 83.5%) and in Jamaica ($n=185$, 82.2%) lacked previous involvement in urban forestry.

Attitudes toward Trees

A very high percentage of respondents in Canarsie ($n=395$, 98.8%) and in Jamaica ($n=363$, 96.3%) reported that urban trees provide benefits. Significantly more respondents in Canarsie reported that trees provide benefits than in Jamaica ($\chi^2 = .026$). Respondents who replied that trees provide benefits reported a range of specific benefits that trees provide (Table 3.4). The top three most reported benefits of trees in both neighborhoods were shade, beautification, oxygen and air quality. Significantly more respondents in Canarsie than in Jamaica reported that trees provide shade (59% vs. 44%), cooling effects (14% vs. 8%), habitat and food for wildlife (12% vs. 7%), shelter and gathering places (7% vs. 3%), places for children to play (5% vs. 1%), improved water quality (5% vs. 2%) and recreation (5% vs. 1%).

Table 3.4: Reported benefits of trees in Canarsie and Jamaica. Respondents were asked if trees provide benefits (n=777). Respondents who reported that trees provide benefits (n=758) were asked to identify the specific benefits trees provide.

| | Canarsie | | | | Jamaica | | | | χ^2 | <i>p-value</i> |
|--|--------------|--------------|--------------|--------------|---------|------|--|--|----------|----------------|
| | Yes % (n) | No % (n) | Yes % (n) | No % (n) | | | | | | |
| Do trees provide benefits?* | 98.8% (395) | 1.3% (5) | 96.3% (363) | 3.7% (14) | 4.938 | .026 | | | | |
| If yes, what benefits? | | | | | | | | | | |
| Shade* | 58.5% (231) | 41.5% (164) | 43.8% (159) | 56.2% (204) | 16.318 | .000 | | | | |
| Beautification | 34.7% (137) | 65.3% (258) | 39.9% (145) | 60.1% (218) | 2.241 | .134 | | | | |
| Oxygen | 31.1% (123) | 68.9% (272) | 28.7% (104) | 71.3% (259) | 0.559 | .455 | | | | |
| Air quality* | 28.6% (113) | 71.4% (282) | 36.6% (133) | 63.4% (230) | 5.566 | .018 | | | | |
| Cooling effects* | 14.2% (56) | 85.8% (339) | 8.0% (29) | 92.0% (334) | 7.276 | .007 | | | | |
| Environment improvement | 13.2% (52) | 86.8% (343) | 10.5% (38) | 89.5% (325) | 1.314 | .252 | | | | |
| Wildlife habitat/food* | 12.2% (48) | 87.8% (347) | 7.4% (27) | 92.6% (336) | 4.715 | .030 | | | | |
| Other | 8.6% (34) | 91.4% (361) | 9.6% (35) | 90.4% (328) | 0.245 | .621 | | | | |
| Shelter/ places to gather* | 6.6% (26) | 93.4% (369) | 2.5% (9) | 97.5% (354) | 7.230 | .000 | | | | |
| Relaxation | 6.1% (24) | 93.9% (371) | 5.0% (18) | 95.0% (345) | 0.451 | .502 | | | | |
| Play areas for children* [#] | 5.1% (20) | 94.9% (375) | .6% (2) | 99.4% (361) | - | .000 | | | | |
| Improve water quality* | 4.8% (19) | 95.2% (376) | 1.7% (6) | 98.3% (357) | 5.912 | .015 | | | | |
| Recreation* [#] | 4.6% (18) | 95.4% (377) | 1.1% (4) | 98.9% (359) | - | .005 | | | | |
| Human health | 2.8% (11) | 97.2% (384) | 2.5% (9) | 97.5% (354) | 0.069 | .793 | | | | |
| Fertilize soil/make compost [#] | 2.0% (8) | 98.0% (387) | .6% (2) | 99.4% (361) | - | .110 | | | | |
| Erosion control | 2.0% (8) | 98.0% (387) | 1.4% (5) | 98.6% (358) | 0.471 | .492 | | | | |
| Spirituality | 1.8% (7) | 98.2% (388) | 1.7% (6) | 98.3% (357) | 0.016 | .899 | | | | |
| Nice smells [#] | 1.0% (4) | 99.0% (392) | .3% (1) | 99.7% (362) | - | .376 | | | | |
| Fruit and nuts [#] | .8% (3) | 99.2% (392) | 3.3% (12) | 96.7% (351) | - | 1.00 | | | | |
| Reduce climate change [#] | .8% (3) | 99.2% (392) | 1.1% (4) | 98.9% (359) | - | .715 | | | | |
| Neighborhood improvement* [#] | .8% (3) | 99.2% (392) | 3.6% (13) | 96.4% (350) | - | .009 | | | | |
| Noise reduction [#] | .5% (2) | 99.5% (393) | .0% (0) | 100.0% (363) | - | .500 | | | | |
| Supply lumber or paper* [#] | .3% (1) | 99.7% (394) | 1.9% (7) | 98.1% (356) | - | .031 | | | | |
| Benefits future generations [#] | .0% (0) | 100.0% (395) | .6% (2) | 99.4% (361) | - | .229 | | | | |
| Increase property values* [#] | .0% (0) | 100.0% (395) | 1.4% (5) | 98.6% (358) | - | .025 | | | | |
| Wind break [#] | .0% (0) | 100.0% (396) | 1.1% (4) | 98.9% (359) | - | .052 | | | | |

* $p < .05$ (χ^2) # $p < .05$ (Fishers Exact Test)

Significantly more respondents in Jamaica than in Canarsie reported that trees improve air quality (29% vs 37%), provide fruit and nuts (3% vs. 1%), neighborhood improvement (1% vs 4%) and supply lumber or paper (2% vs. less than 1%). Thus, trees in Canarsie Park were associated with more environmental and recreation benefits than were trees along streets in Jamaica. Street trees in Jamaica were associated with air quality, providing resources (fruit, nuts, paper, lumber) and neighborhood improvement more than in Canarsie.

In Jamaica, there was a minimal but significant effect of gender on the attitude that trees provide benefits ($\chi^2=4.817$, $\phi=0.116$, $p=0.028$). More males (54%) than females (46%) reported that trees provide benefits. In Jamaica, tree benefits was significantly related to educational interest (Fishers =.007, $\phi = .148$). The majority of people who said that trees provide benefits (n=216, 98.6%) also had an educational interest in learning more about trees.

Many survey respondents in Canarsie (n=206, 51.8%) and in Jamaica (n=238, 61.5%) reported that trees cause problems, with significantly more respondents in Jamaica holding this view than in Canarsie ($\chi^2= 7.576$, $p=.006$). Among people who reported that trees cause problems, a variety of problems caused by trees were identified (Table 3.5). Significantly more respondents in Canarsie than in Jamaica reported that trees cause allergies (15.5% vs. 5.8%), attract nuisance animals (11.2% vs. 4.5%), and foster criminal activity (4.4% vs. 0%). Significantly more respondents in Jamaica than in Canarsie reported that trees cause sidewalk damage (9.1% vs. 2.4%), property damage (20.2% vs. 2.4%), utility line damage (6.6% vs. 1.9%) and damage to sewage lines (8.3% vs. 1.5%).

Table 3.5: Reported problems caused by trees in Canarsie and Jamaica. Respondents were asked if trees cause problems (n = 785). Respondents who reported that trees cause problems (n=444) were asked to identify the specific benefits trees provide.

| | Canarsie | | Jamaica | | χ^2 | p-value |
|------------------------------|--------------|--------------|--------------|--------------|----------|---------|
| | Yes % (n) | No % (n) | Yes % (n) | No % (n) | | |
| Do trees cause problems? * | 51.8% (206) | 48.2% (192) | 61.5% (238) | 38.5% (149) | 7.576 | .006 |
| If yes, what problems? * | | | | | | |
| Falling trees/branches * | 36.9% (76) | 63.1% (130) | 49.2% (119) | 50.8% (123) | 6.827 | .009 |
| Fruit/nuts/ sap to clean | 18.9% (39) | 81.1% (167) | 19.0% (46) | 81.0% (196) | 0.000 | .984 |
| Allergies* | 15.5% (32) | 84.5% (174) | 5.8% (14) | 94.2% (228) | 11.478 | .001 |
| Nuisance animals* | 11.2% (23) | 88.8% (183) | 4.5% (11) | 95.5% (231) | 6.953 | .008 |
| Maintenance issues | 8.3% (17) | 91.7% (189) | 12.8% (31) | 87.2% (211) | 2.416 | .120 |
| Other | 7.3% (15) | 92.7% (191) | 6.2% (15) | 93.8% (227) | 0.209 | .648 |
| Too many trees/trees too big | 4.9% (10) | 95.1% (196) | 6.2% (15) | 93.8% (227) | 0.381 | .537 |
| Criminal activity** | 4.4% (9) | 95.6% (197) | .0% (0) | 100.0% (242) | - | .001 |
| Sidewalk damage** | 2.4% (5) | 97.6% (201) | 9.1% (22) | 90.9% (220) | - | .004 |
| Human injury/death | 2.4% (5) | 97.6% (201) | 4.5% (11) | 95.5% (231) | - | .309 |
| Attract litter/dog waste | 2.4% (5) | 97.6% (201) | 1.2% (3) | 98.8% (239) | - | .479 |
| Property damage** | 2.4% (5) | 97.6% (201) | 20.2% (49) | 79.8% (193) | - | .000 |
| Utility line damage** | 1.9% (4) | 98.1% (202) | 6.6% (16) | 93.4% (226) | - | .021 |
| Block playing fields | 1.5% (3) | 98.5% (203) | .0% (0) | 100.0% (242) | - | .060 |
| Sewage line damage** | 1.5% (3) | 98.5% (203) | 8.3% (20) | 91.7% (222) | - | .001 |
| Block views/signage | 1.0% (2) | 99.0% (204) | 1.7% (4) | 98.3% (238) | - | .691 |
| Bad smells | .0% (0) | 100.0% (206) | .4% (1) | 99.6% (241) | - | 1.00 |
| Block cars | .0% (0) | 100.0% (206) | 1.2% (3) | 98.8% (239) | - | .253 |

* p < .05 (χ^2) # p < .05 (Fishers Exact Test)

In Jamaica, there was a significant relationship between the view that trees cause problems and educational interest ($\chi^2 = 7.252$, $p = 0.007$). The majority of people who reported that trees cause problems (55.2%) said that they would be interested in learning more about trees. Educational interest had a small negative effect on the view that trees cause problems ($\phi = -0.139$). Many survey respondents in Canarsie ($n=206$, 51.8%) and in Jamaica ($n=238$, 61.5%) reported that trees cause problems, with significantly more respondents in Jamaica holding this view than in Canarsie ($\chi^2 = 7.576$, $p=.006$). Among people who reported that trees cause problems, a variety of problems caused by trees were identified (Table 3.5).

Significantly more respondents in Canarsie than in Jamaica reported that trees cause allergies (15.5% vs. 5.8%), attract nuisance animals (11.2% vs. 4.5%), and criminal activity (4.4% vs. 0%). Significantly more respondents in Jamaica than in Canarsie reported that trees cause sidewalk damage (9.1% vs. 2.4%), property damage (20.2% vs. 2.4%), utility line damage (6.6% vs. 1.9%) and damage to sewage lines (8.3% vs. 1.5%). In Jamaica, there was a significant relationship between the view that trees cause problems and educational interest ($\chi^2 = 7.252$, $p = 0.007$). The majority of people who reported that trees cause problems (55.2%) said that they would be interested in learning more about trees. Educational interest had a small negative effect on the view that trees cause problems ($\phi = -0.139$) in Jamaica.

Residents' Beliefs Toward Shared Urban Forest Governance for Park Trees and Street Trees

Survey respondents were asked who they thought should be responsible for maintaining the trees planted in Canarsie Park and along streets in Jamaica; respondents were allowed to identify more than one entity. These responses were used to create mutually exclusive categories of government, civil society and shared responsibility (Table 3.6). Most survey respondents

reported that a government entity should be responsible for UTM, but there were differences between each site in terms of the specific government entities that were identified. Whereas the most frequently reported government entity by Canarsie respondents was the NYC Parks Department (n=174, 43.9%), the majority of respondents in Jamaica said “city government” in general should be responsible (n=239, 62.7%). “City government” was the second most frequently reported entity in Canarsie (n=151, 38.1%).

Table 3.6: Beliefs about urban forest governance between government, civil society and residents in Canarsie and Jamaica

| | Canarsie | | Jamaica | | χ^2 | p-value |
|-----------------------|-----------------|--------------|----------------|--------------|----------|----------------|
| | Yes | % (n) | Yes | % (n) | | |
| Government only** | 68.4% | (271) | 59.6% | (227) | 6.615 | .010 |
| Civil society only | 9.1% | (36) | 12.3% | (47) | 2.143 | .143 |
| Shared responsibility | 19.9% | (79) | 23.6% | (90) | 1.539 | .215 |

** p < .10

Chi-square tests revealed that the differences between the two study sites were significant for the “NYC Parks Department” code category ($\chi^2=130.448$, $p=.000$) and for the “city government” category ($\chi^2=46.998$, $p=.000$). Significantly more respondents in Canarsie (n=174, 43.9%) than in Jamaica (n=30, 7.9%) reported that the NYC Parks Department should be responsible, whereas more respondents in Jamaica (n=239, 62.7%) than in Canarsie (n=151, 38.1%) reported that “city government” should be responsible. Far fewer respondents in each neighborhood endorsed civil society responsibility. Significantly more respondents in Jamaica (n=48, 13.9%) than in Canarsie (n=36, 9.1%) believed that residents, apartment tenants, homeowners and “people who live here,” should be responsible ($\chi^2=4.448$, $p=.035$). The third most frequently reported entity in both study sites was “everyone.” 12.6% (n=48) of respondents

in Jamaica and 10.4% (n=41) of respondents in Canarsie said that “everyone” should be responsible for the maintenance of urban trees. Fourteen respondents (3.5%) in Canarsie and zero respondents in Jamaica reported that “park users” should be responsible. Significantly more respondents in Jamaica than in Canarsie reported that “landlords and businesses” or an “other” entity should be responsible for maintaining trees.

When the non-mutually exclusive responses were combined into the mutually exclusive categories of government, civil society and shared responsibility, results reveal that the majority of respondents in Canarsie (n=271, 68.4%) and in Jamaica (n=227, 59.6%) reported that only a government entity should be responsible. Significantly more respondents in Canarsie than in Jamaica believed that government should be responsible for maintain trees ($\chi^2=6.615$, $p=.01$). Far fewer participants reported that only civil society should be responsible. Thirty-six participants in Canarsie (9.1%) and 47 participants in Jamaica (12.3%) fell into this category. Less than one-quarter of participants in each neighborhood said that maintenance of trees is a shared responsibility. Seventy-nine participants in Canarsie (19.9%) and 90 participants in Jamaica (23.6%) fell into the shared responsibility category. Appendix 2 contains chi-square analysis for all dependent variables by the three independent variables (government, civil society and shared responsibility).

Government Responsibility

A binary logistic regression analysis was conducted to predict “government responsibility” (the probability that respondents only identified government entities as responsible for urban tree maintenance) using age, race, gender, previous involvement,

educational interest, awareness of recent planting, and tree problems as predictors (Table 3.7). The model was statistically significant ($\chi^2 = 20.980$, $df = 11$, $p = 0.034$) and it revealed that males were almost twice as likely than females ($\beta = .605$, Odds ratio = 1.832, $p = .025$) to report that government should be responsible. Also, respondents with previous involvement ($\beta = -0.732$, $p = .054$) and an educational interest ($\beta = -0.725$, $p = .015$) were significantly less likely to hold the view that government should be responsible.

Table 3.7: Binary logistic regression results for government responsibility in Canarsie

| | β | S.E. | Wald | df | p-value | Odds Ratio Exp (B) |
|---|---------|------|-------|----|---------|-----------------------|
| 18-24 (ref) | -- | -- | 1.906 | 3 | .592 | -- |
| 25-44 | -.208 | .508 | .168 | 1 | .682 | .812 |
| 45-64 | .122 | .510 | .057 | 1 | .811 | 1.130 |
| 65+ | .392 | .672 | .340 | 1 | .560 | 1.479 |
| White Non-Hispanic (ref) | -- | -- | 1.413 | 3 | .703 | -- |
| Black/African American Non-Hispanic | .031 | .441 | .005 | 1 | .943 | 1.032 |
| Some Other Race Non-Hispanic ^a | .322 | .522 | .379 | 1 | .538 | 1.380 |
| Hispanic Origin | -.253 | .536 | .222 | 1 | .638 | .777 |
| Male | .605 | .271 | 4.990 | 1 | .025** | 1.832 |
| Previous involvement | -.732 | .380 | 3.719 | 1 | .054* | .481 |
| Educational interest | -.725 | .298 | 5.910 | 1 | .015** | .484 |
| Awareness of recent planting | -.138 | .283 | .239 | 1 | .625 | .871 |
| Tree problems | .269 | .274 | .963 | 1 | .326 | 1.309 |

^a Also includes Asian, American Indian, Non-Hispanic two or more races

Model Significance: $\chi^2 = 20.980$, $df = 11$, $p\text{-value} = 0.034$

-2 Log Likelihood = 325.952

** $p < .05$ * $p < .10$

A binary logistic regression model effectively predicted government responsibility in Jamaica ($\chi^2 = 22.030$, $df = 12$, $p = .030$) (Table 3.8). People with an educational interest were less likely to believe that government should be responsible ($\beta = -.506$, $p = .040$). Males were less likely than females to report government responsibility ($\beta = -.402$, $p = .086$). People who believed

that trees cause problems were 1.5 times as likely than people who said trees do not cause problems to believe that government should be responsible for tree maintenance ($\beta = -.402$, Odds ratio = 1.510, $p=.086$).

Table 3.8: Logistic regression results for government responsibility in Jamaica

| | β | S.E. | Wald | df | p-value | Odds Ratio Exp (B) |
|--|---------|------|-------|----|---------|-----------------------|
| 18-24 (ref) | -- | -- | 1.383 | 3 | .710 | -- |
| 25-44 | .172 | .375 | .211 | 1 | .646 | 1.188 |
| 45-64 | .050 | .376 | .018 | 1 | .894 | 1.051 |
| 65+ | .495 | .498 | .989 | 1 | .320 | 1.641 |
| 45 years or older | -.020 | .273 | .006 | 1 | .940 | .980 |
| White Nonhispanic (ref) | -- | -- | 4.120 | 4 | .390 | -- |
| Black/African American Nonhispanic | -.431 | .577 | .558 | 1 | .455 | .650 |
| Asian/Pacific-Islander Nonhispanic | -.691 | .648 | 1.140 | 1 | .286 | .501 |
| Some Other Race Nonhispanic ^a | -.704 | .590 | 1.426 | 1 | .232 | .495 |
| Hispanic Origin | -.975 | .615 | 2.513 | 1 | .113 | .377 |
| Male | -.402 | .234 | 2.953 | 1 | .086* | .669 |
| Previous involvement | .018 | .345 | .003 | 1 | .957 | 1.019 |
| Educational interest | -.506 | .247 | 4.206 | 1 | .040** | .603 |
| Awareness of recent planting | .352 | .249 | 2.005 | 1 | .157 | 1.422 |
| Tree problems | .412 | .240 | 2.961 | 1 | .085* | 1.510 |

^a Also includes American Indian and Non-Hispanic two or more races

Model Significance: $\chi^2 = 22.755$, $df = 12$, $p\text{-value} = 0.30$

-2 Log Likelihood = 434.960

** $p < .05$ * $p < .10$

Civil society responsibility

A binary logistic regression effectively predicted civil society responsibility in Canarsie ($\chi^2 = 14.879$, $df = 7$, $p = 0.038$), finding that male gender and previous involvement were significant predictors of civil society responsibility (Table 3.9). Males were less likely than females ($\beta = -.708$, $p=.090$) to believe that civil society should be responsible for urban tree maintenance. Respondents who had previous involvement were more than three times as likely

than people without previous involvement to believe that civil society should be responsible ($\beta = 1.165$, Odds ratio = 3.205, $p = .012$). A logistic regression model did not significantly predict civil society responsibility in Jamaica ($\chi^2 = 4.420$, $df = 8$, $p = 0.811$).

Table 3.9: Binary logistic regression results for civil society responsible in Canarsie

| | β | S.E. | Wald | df | p-value | Odds Ratio Exp (B) |
|---|---------|------|-------|----|---------|-----------------------|
| 45 years or older | -.381 | .416 | .838 | 1 | .360 | .683 |
| African-American | .635 | .439 | 2.093 | 1 | .148 | 1.886 |
| Male | -.708 | .417 | 2.883 | 1 | .090* | .493 |
| Previous involvement | 1.165 | .465 | 6.288 | 1 | .012** | 3.205 |
| Educational interest | .538 | .472 | 1.302 | 1 | .254 | 1.713 |
| Awareness of recent planting | -.114 | .431 | .070 | 1 | .791 | .892 |
| Tree problems | -.290 | .413 | .492 | 1 | .483 | .749 |
| Model Significance: $\chi^2 = 14.879$, $df = 7$, p -value = 0.038 | | | | | | |
| -2 Log Likelihood = 170.195 | | | | | | |
| ** $p < .05$ * $p < .10$ | | | | | | |

Shared Responsibility

A logistic regression model effectively predicted shared responsibility in Jamaica ($\chi^2 = 22.915$, $df = 10$, $p = 0.011$) (Table 3.10). Respondents of White Non-Hispanic background were more likely than respondents of other racial backgrounds to believe that urban tree maintenance is a shared responsibility ($p = .066$). Also, people who had an educational interest were almost twice as likely than people without an educational interest to support shared governance responsibility ($\beta = .673$, Odds ratio = 1.90, $p = .022$). Logistic regression did not effectively predict shared responsibility in Canarsie ($\chi^2 = 9.121$, $df = 11$, $p = 0.611$).

Table 3.10: Binary logistic regression results for shared responsibility in Jamaica

| | β | S.E. | Wald | df | p-value | Odds Ratio Exp (B) |
|--|---------|------|-------|----|---------|-----------------------|
| 45 years or older | -.020 | .273 | .006 | 1 | .940 | .980 |
| White Nonhispanic (ref) | -- | -- | 8.798 | 4 | .066* | -- |
| Black/African American Nonhispanic | -.396 | .631 | .393 | 1 | .531 | .673 |
| Asian/Pacific-Islander Nonhispanic | .183 | .697 | .069 | 1 | .793 | 1.200 |
| Some Other Race Nonhispanic ^a | .249 | .635 | .154 | 1 | .695 | 1.283 |
| Hispanic Origin | .668 | .653 | 1.047 | 1 | .306 | 1.950 |
| Male | .372 | .269 | 1.909 | 1 | .167 | 1.450 |
| Previous involvement | .501 | .363 | 1.906 | 1 | .167 | 1.650 |
| Educational interest | .673 | .295 | 5.209 | 1 | .022** | 1.960 |
| Awareness of recent planting | -.248 | .286 | .756 | 1 | .385 | .780 |
| Tree problems | -.108 | .272 | .158 | 1 | .691 | .898 |

^a Also includes American Indian and Non-Hispanic two or more races

Model Significance: $\chi^2 = 22.915$, df = 10, p-value = 0.011

-2 Log Likelihood = 352.761

** p < .05 * p < .10

Summary of Logistic Regression Results

The independent variables (examined using logistic regression) were fairly good predictors of beliefs toward urban forest governance (Table 3.11). Educational interest was the strongest predictor, as this item was significant at the 95% level in both study sites for government responsibility and shared responsibility. Educational interest was negatively associated with government responsibility, but positively associated with shared responsibility in both study sites. Male gender was also significant in more than one regression model. Male gender was positively associated with government responsibility in Canarsie, but negatively associated in Jamaica. Male gender was also negatively associated with civil society responsibility in Canarsie; this item was not significant in Jamaica for civil society responsibility.

Table 3.11: Summary of logistic regression results for government, civil society and shared responsibility in Canarsie and Jamaica. Odds ratios and the direction of the beta-coefficient for significantly predicted items are provided. Significance is indicated by asterisk(s). Items or models that were not significant (n.s.) are also indicated.

| | Canarsie | | Jamaica | |
|-------------------------------------|------------|------------|------------|------------|
| | β | Odds Ratio | β | Odds Ratio |
| Government responsibility | | | | |
| Male | (+) | 1.832** | (-) | .669* |
| Previous involvement | (-) | .481* | Item n.s. | Item n.s. |
| Educational interest | (-) | .484** | (-) | .603** |
| Tree problems | Item n.s. | Item n.s. | (+) | 1.510* |
| Civil society responsibility | | | | |
| Male | (-) | .493* | Model n.s. | Model n.s. |
| Previous involvement | (+) | 3.205** | Model n.s. | Model n.s. |
| Shared responsibility | | | | |
| Educational interest | Model n.s. | Model n.s. | (+) | 1.960** |
| White Non-Hispanic | Model n.s. | Model n.s. | (ref) | * |

** p < .05 * p < .10

Previous involvement was significant in more than one model. In Canarsie, there was a negative association between previous involvement and government responsibility, but a positive association with civil society responsibility. The odds ratio was the largest for previous involvement in Canarsie than any other variable in either study site. Two items that were significant in Jamaica and not in Canarsie were tree problems and White non-Hispanic race. The view that trees cause problems was positively related to government responsibility and white non-Hispanic race was positively related to shared responsibility.

Discussion

This study found that many residents had positive attitudes toward trees and the benefits they provide. This finding is consistent with other studies that found many people have positive attitudes toward trees (Lohr et al. 2004; Gorman 2004; Zhang et al. 2007; Allred et al. 2010; Zhang et al. 2011). There were significant differences between the benefits of trees that were

reported in Canarsie and in Jamaica. Respondents in Canarsie reported environmental and recreation benefits of trees (shade, cooling effects, wildlife habitat, shelter and gathering places, place for children to play, water quality). This finding is not surprising given that the Canarsie study site was a park with natural and recreation areas. In Jamaica, the types of tree benefits that were reported dealt with resources that trees provide (fruit and nuts, lumber and paper) as well as improved air quality and neighborhood improvement. That more respondents in Jamaica than in Canarsie identified the resources provided to humans makes sense given that street trees are part of the built environment inhabited by urban residents. These results are in line with an earlier study of attitudes toward urban trees that found that volunteers attributed different environmental and community outcomes to trees planted in their neighborhoods (urban environments) versus in urban parks (natural areas) (Moskell et al. 2010).

More than half of respondents also reported that trees cause problems in each neighborhood, tree problems were reported by more respondents in Jamaica than in Canarsie. The tree problems in Jamaica dealt more with property damage (to sidewalks, utilities and sewage lines) whereas the problems reported in Canarsie were more environmental in that allergies are caused by exposure to certain tree species and that nuisance animals inhabit natural areas in the Park. Since people live near street trees in Jamaica, many survey participants may have more experiences with the problems caused by trees than participants who frequent Canarsie Park. The Jamaica survey was conducted in March 2010 following a large blizzard in New York City, so falling trees and tree branches as a result of this storm may have still been on the minds of participants in the Jamaica survey.

Very few participants had previous involvement in urban tree care. In Jamaica, significantly more males than females reported that they had previous involvement. This result is

similar to another study conducted in South Carolina by Straka et al. (2005), which had also found that males had higher levels of participation in urban and community forestry programs than females. About one third of participants in both neighborhoods had noticed recently planted trees, but more people in Canarsie than in Jamaica reported they had recently seen tree plantings. This result may be explained by the timing of the survey. The survey was conducted in Jamaica in mid-March when snow was still on the ground and before leaves were on the trees. However, the trees were fully bloomed when the survey was conducted in Canarsie in late May. It is possible that seasonal differences may have accounted for more people noticing trees being planted in Canarsie than in Jamaica.

Many respondents in Canarsie and Jamaica said they would be interested in learning about trees in the future. This result is in line with a previous study also found a high level of interest for learning more about trees among urban residents. A survey conducted in the South Bronx neighborhood of New York City found that a majority of participants (76%) wanted to learn more about trees (Allred et al. 2010). The current study found that the majority of people who expressed an educational interest lacked previous involvement, which suggests that people without previous involvement may have less knowledge about the topic and may be interested in learning more. In Jamaica, there was a significant relationship between educational interest and the view that trees provide benefits, as well as the view that trees cause problems. Perhaps this suggests that people might be interested in learning how to take care of trees so that the trees continue to provide benefits, but that they might also want to learn how to take care of trees to prevent the problems that they cause.

Beliefs Toward Urban Forest Governance

This study found that the majority of respondents in both study sites believed that only government should be responsible for taking care of trees in Canarsie Park and street trees in Jamaica. Results suggest that beliefs toward urban forest governance are dependent upon personal characteristics, such as gender. For example, government responsibility was associated with male gender in each study site, although this relationship was positive in Canarsie and negative in Jamaica. Previous studies have found that females exhibit more concern for environmental issues than males (see Konisky et al. 2008 for a review), which suggests that females may be more likely to volunteer in environmental management projects.

Thus, the results of the current study could be explained by different preferences for the governance of urban forests street and park settings between males and females. Males may prefer that the government be responsible for urban forest management, whereas females may prefer that civil society and volunteers be responsible for urban forest management. Previous studies have also found gender differences in attitudes toward urban forest management, as measured by willingness to pay for urban forestry programs, although results have been mixed. Lorenzo et al. (2000) found that males were more willing than females to pay a larger hypothetical tax for tree preservation than females. Zhang and Zheng (2011) found that females were willing to donate \$14 more on average than males to urban forestry programs. Male gender was also negatively related to civil society responsibility in Canarsie, suggesting that females are more likely to think that civil society should be involved than males. Indeed, studies on urban forest volunteerism have found that females participate at a higher rate than males (Still and Gerhold 1997; Moskell et al. 2010; Fisher et al. 2011).

The other personal characteristic that significantly predicted governance beliefs was race.

Race was positively associated with shared responsibility in Jamaica, but not in Canarsie. The result for race being significant for shared responsibility of street trees may be explained by race differences in attitudes toward urban forest management. Zhang et al. (2007) found that people of non-white race were more likely than Caucasians to regard the federal government as being responsible for urban forest management. Zhang et al. (2011) found that African-American families reported they would donate \$18 less than white families. Thus, perhaps some races have different levels of support for urban forest management and regard different levels of government as responsible for environmental management, as was seen in the current study.

The strongest predictor of urban forest governance beliefs was previous involvement in urban forestry. This variable was only significant in Canarsie and was negatively associated with government responsibility, but it was very strongly and positively predictive of civil society responsibility. Perhaps this variable was only significant in Canarsie because the park setting may be perceived as more conducive for conducting urban forestry volunteerism activities than the street tree setting in Jamaica. In a previous study, urban forestry volunteers reported that an impact of urban trees in parks was “involving the community in stewardship,” but volunteers did not attribute this impact to trees planted in their own neighborhoods (Moskell et al. 2010). The study authors suggested that stewardship behaviors (i.e. involvement in urban forestry) might be perceived as an activity that occurs more frequently in natural areas that have large stands of trees than in urban built environments where street trees are planted more sparsely (Moskell et al. 2010).

People who had previous involvement in urban forestry were more than three times as likely to think civil society should be responsible than people without previous involvement. This result makes sense if we assume that many of the people with previous involvement had

gained this experience by volunteering with a civil society organization. This result suggests that experience in urban forest stewardship is associated with the belief that civil society organizations play a role in urban forest governance. Volunteering to plant or care for trees with a non-profit or community group may help volunteers witness first-hand the role that these organizations play in managing urban forests. People without these experiences may have less knowledge about civil society's involvement in urban forest management, and thus may be more likely to regard government as responsible.

Educational interest was the second best predictor of beliefs toward urban forest governance. In both Canarsie and Jamaica, this variable was negatively associated with government responsibility and positively associated with shared responsibility in Jamaica. Having an educational interest in learning more about trees implies that a person might be willing to gain knowledge about trees in order to take some sort of action related to trees. A person without an interest to learn more about trees may think that trees are not relevant to their life and that they are not interested in taking actions related to trees. Thus, having an educational interest in something implies a motivation to do something about it. If I thought that the government was responsible for urban tree care, that someone else will just take the action, I would not waste my time learning about trees because it's not my responsibility. Thus, perhaps the people who were interested were motivated to take actions related to trees versus just leaving it up to government.

While the logistic regression models for government responsibility were significant in Canarsie and in Jamaica, only some of the remaining models were significant in both sites. The model significantly predicted civil society responsibility in Canarsie, but not in Jamaica, and the model was significant for shared responsibility in Jamaica, but not in Canarsie. This result may

be due to the manner in which beliefs toward urban forest governance was measured and analyzed in this study. First, the survey question “who do you think should be responsible for taking care of trees?” was purposely developed to be broad in order to make it easy for survey participants to understand and to answer in a very short amount of time. However, asking this question may have resulted in an overly simplistic data set that does not represent the full extent of people’s beliefs toward urban forest governance. These beliefs may also encompass preferences for which entities should be responsible for specific management activities. A person could prefer that civil society organizations and volunteers plant trees in their neighborhood, but would prefer to have government be responsible for pruning the trees, for example. Furthermore, the independent variables measured in this study (previous involvement, awareness of tree planting, educational interest, attitudes toward trees and demographics) may not be as strongly related to beliefs toward urban forest governance as other factors such as opinions about the New York City Department of Parks and Recreation or the city’s tree planting policies or attitudes toward the MTNYC initiative. Another factor that may influence beliefs toward governance is the level of confidence or trust in a government or civil society entity in carrying out urban forest management activities. Previous research has found that level of confidence in difference levels of government (state, local and federal) are correlated with assigning preference for which level of government should be responsible for a specific realm of policy-making (see Konisky 2011 for a review). Future replications of the survey presented in the current study should include these additional factors that may be effective predictors of beliefs toward urban forest governance.

The results of this study suggest that beliefs toward urban forest governance may be place-specific. However, I cannot conclude that beliefs toward urban forest governance are due

to differences between each site because I did not use experimental design to choose the study sites or to conduct the survey. Nevertheless given the results of this study, beliefs toward urban forest governance seem to be different for street tree and park tree settings. It might be that park settings lend themselves to management by a defined group, such as the Parks Department or a Friends of the Park-type group. Canarsie Park is clearly managed by “someone”—Parks Department staff, office buildings and vehicle are present within the park, there is Parks Department signage posted and the park is entirely fenced in. Thus, Canarsie residents and park users may perceive these trees to belong to the Parks Department or to whomever takes care of the park and the trees. However, trees planted along a street in Jamaica do not appear to be managed by any one entity. Sidewalks are a gray area between public and private property (Rae et al. 2010). Since there are so many people who pass through and interact with sidewalk areas, any one of multiple users of that space could potentially be responsible for urban tree maintenance. This may offer an explanation for why the shared responsibility logistic regression model was effective in Jamaica, but not in Canarsie.

Implications for urban forest governance

The results of this study indicate that a majority of residents do not recognize themselves or civil society as sharing responsibility with government for urban forest management. Thus, calls made by ‘million-tree’ planting campaigns for residents to take on part of the responsibility for stewarding newly planted trees may not come to fruition. While there certainly are many residents who are willing to steward these trees independently or as part of a volunteer stewardship organization, there are probably many more trees than there are volunteer stewards

to take care of them in a timely manner. This may especially be the case in neighborhoods where stewardship organizations do not exist and where residents may lack the knowledge or physical tools for taking care of nearby trees. Furthermore, recent studies have suggested that stewardship efforts by volunteers may perpetuate disparities in the urban forest canopy by only planting trees where volunteers are present (Conway et al. 2011; Perkins 2009).

Increasing the involvement of residents and private property owners in tree planting decisions may help to foster a sense of responsibility among these stakeholders. For example, Million Trees Los Angeles does not plant trees on public property in residential neighborhoods without a signed permission slip from the adjacent property owner (Pincetl 2010b). This type of planting approach may be effective for informing residents and property owners about the tree planting program, and for allowing people to choose if they want a tree outside of their property. Stakeholders who decide to receive a tree can then be informed about the responsibilities they will have for providing care to the tree. However, this approach may also contribute to disparities in urban forest canopy cover if the only residents who say yes to tree plantings are those people with the resources to maintain the trees.

The findings of this study suggest that previous involvement in urban tree care and an interest in learning more about trees are strongly associated with beliefs that actors outside of government should be responsible for urban tree maintenance. Thus, the effective engagement of residents and property owners in urban forestry programs and volunteer activities (e.g. tree planting and stewardship events) may help to foster a sense of shared responsibility among these stakeholders. These findings emphasize the need for urban forestry practitioners to communicate about urban forestry in a way that inspires stakeholders to participate in urban forest planning, planting and stewardship.

Since this study revealed that beliefs toward governance were dependent upon the context where trees were planted, engagement and educational campaigns may need to use different approaches for fostering stewardship in park and street settings. In parks settings, there is typically a municipal park management department that has a visible presence in the park (e.g. signage, staff). In street tree settings, the municipal department charged with urban forest management may have a less visible presence within the setting. Thus, educational campaigns in parks may need to emphasize how the public can assist and supplement the work that may be visibly conducted by municipal park management staff. Conversely, educational campaigns in street settings may need to first identify the urban forest managers that are active within the setting before emphasizing how residents and property owners can participate in the urban forest management activities occurring in the street tree setting.

Beliefs toward urban forest governance are complex. Shared governance is also hard to define and to measure because there can be varying degrees of responsibility held by different actors in the public and private sector. This study was an initial attempt to measure shared urban forest governance. The survey conducted in this study did not examine additional factors that may shape beliefs toward different governance arrangements for urban forest management, such as political ideology and political party identification. Future research that includes these variables may lead to a greater understanding of the factors that shapes beliefs toward urban forest governance. Additionally, future research could further examine how beliefs toward urban forest governance may differ for trees planted in parks and streets to uncover whether people believe that different forms of governance should occur in each setting. Another avenue for future research includes investigating how the urban forest governance beliefs of urban forestry volunteers compare to the urban forest governance beliefs of people who have not participated in

urban forestry activities. Such research could provide additional insight into whether previous involvement is associated with the belief that urban forest maintenance is a shared responsibility among government, civil society and residents.

Conclusions and Limitations

This study enhances our understanding of urban residents' attitudes toward urban trees and beliefs toward urban forest governance, finding that many residents do not view themselves as sharing responsibility with local government or civil society for the maintenance of urban trees. The results of this research suggest that government agencies and non-profit organizations need to effectively engage residents and property owners in urban forest management activities to demonstrate to stakeholders the role that they can play in planting and caring for trees in their community. Education and outreach programs for stakeholder engagement need to be designed in a way that will fulfill people's interests for learning more about trees and that offer people an opportunity to become involved in urban forestry activities.

While the survey methodology used in this study allowed for face-to-face interactions with residents, it is not without its limitations. The manner in which the on-site survey method was implemented prevented the surveyors from collecting data about survey-non-respondents. Also, having more bi-lingual or multi-lingual surveyors could have helped to increase the survey cooperation rate and the representativeness of the sample, especially for the ethnic minority populations in each neighborhood. We asked about race in the form of an open-ended question, which produced confusion among many respondents who reported their ethnicity rather than race; a closed-ended question about race could have avoided this issue.

REFERENCES

- Adger, W.N. and A. Jordan. 2009. *Governing Sustainability*. Cambridge: Cambridge University Press.
- Akbari, H., M. Pomerantz, and H. Taha. 2001. Cool surfaces and shade trees to reduce energy use and improve air quality in urban areas. *Solar Energy* 70 (3): 295-310.
- Arceneaux, K. 2005. Does federalism weaken democratic representation in the United States? *Publius: The Journal of Federalism* 35 (2): 297-311.
- Austin, M.E. 2002. Partnership opportunities in neighborhood tree planting initiatives: Building from local knowledge. *Journal of Arboriculture* 28 (4): 178-186.
- Boyce, S.E. 2011. It takes A stewardship village: Is community-based urban tree stewardship effective? *Cities and the Environment* 3 (1): Article 3.
- Brinkerhoff, D.W. and J.M. Brinkerhoff. 2011. Public--Private partnerships: Perspectives on purposes, publicness, and good governance. *Public Administration and Development* 31 (1): 2-14.
- Brinkerhoff, J.M. 2002. Government--Nonprofit partnership: A defining framework. *Public Administration and Development* 22 (1): 19-30.
- Broussard Allred, S., G. Ferenz, N. Jena, V. Lambert, C. Tse, and K. Loria. 2010. *Community Views of Urban Forests in the South Bronx, New York*. Human Dimensions Research Unit Outreach Series 10-1. Department of Natural Resources, Cornell University. Ithaca, NY.
- Cantril, A.H. and S.D. Cantril. 1999. *Reading Mixed Signals: Ambivalence in American Public Opinion About Government*. Baltimore: Woodrow Wilson Center Press.
- Center for Urban Research, City University of New York. 2011 The Open Accessible Space Information System: Stewardship Organization Search. <http://www.oasisnyc.net/stewardship/stewardshipsearch.aspx> (accessed September 12, 2011).

- City of New York. 2007. PlaNYC: A Greener, Greater, New York, Mayor Michael R. Bloomberg, The City of New York.
<http://www.nyc.gov/html/planyc2030/html/home/home.shtml> (accessed 07/15/2011).
- Conway, T.M., T. Shakeel, and J. Atallah. 2011. Community groups and urban forestry activity: Drivers of uneven canopy cover? *Landscape and Urban Planning* 101 (2011): 321-329.
- Dai, D. 2011. Racial/ethnic and socioeconomic disparities in urban green space accessibility: Where to intervene? *Landscape and Urban Planning* 102 (2011): 234-244.
- Davenport, M.A., J.E. Leahy, D.H. Anderson, and P.J. Jakes. 2007. Building trust in natural resource management within local communities: A case study of the Midewin National Tall grass Prairie. *Environmental Management* 39 (3): 353-368.
- Dwyer, J.F., E.G. McPherson, H.W. Schroeder, and R.A. Rowntree. 1992. Assessing the benefits and costs of the urban forest. *Journal of Arboriculture* 18 (5): 227-227.
- Elmendorf, W. 2008. The importance of trees and nature in community: A review of relative literature. *Arboriculture & Urban Forestry* 34 (3): 152-156.
- Elmendorf, W.F., F.K. Willits, V. Sasidharan, and G. Godbey. 2005. Urban park and forest participation and landscape preference: A comparison between Blacks and Whites in Philadelphia and Atlanta, US. *Journal of Arboriculture* 31 (6): 318-325.
- Fraser, E.D. and W.A. Kenney. 2000. Cultural background and landscape history as factors affecting perceptions of the urban forest. *Journal of Arboriculture* 26 (2): 106-113.
- Gooberman, S. Executive Director of TreesNY. Personal communication. July 2010.
- Gorman, J. 2004. Residents' opinions on the value of street trees depending on tree location. *Journal of Arboriculture* 30 (1): 36-44.
- Griffin, L. 2010. Governance innovation for sustainability: Exploring the tensions and dilemmas. *Environmental Policy and Governance* 20 (6): 365-369.

Grove, J.M., J. O'Neil-Dunne, K. Pelletier, D. Nowak, and J. Walton. 2006. A report on New York City's present and possible urban tree canopy. South Burlington, VT: US Department of Agriculture, Forest Service, Northeastern Research Station.

Heimlich, J., T.D. Sydnor, M. Bumgardner, and P. O'Brien. 2008. Attitudes of residents toward street trees on four streets in Toledo, Ohio, US before removal of ash trees (*Fraxinus* spp.) from Emerald Ash Borer (*Agrillus planipennis*). *Arboriculture & Urban Forestry* 34 (1): 47-53.

Jaccarino, M. 2010. Mayor Bloomberg's MillionTreeNYC plan leaves homeowners up a tree for sidewalk and sewer repairs. *New York Daily News*, February 28.

Johnston, M. and L.D. Shimada. 2004. Urban forestry in a multicultural society. *Journal of Arboriculture* 30 (3): 185-192.

Kenney, W.A., P.J.E. van Wassenae, and A.L. Satel. 2011. Criteria and indicators for strategic urban forest planning and management. *Arboriculture & Urban Forestry* 37 (3): 108-117.

Kielbaso, J., Beauchamp, B., K. Larison, and C. Randall. 1988. Trends in Urban Forestry Management. Baseline Data Report 20(1). International City Management Association. Washington, DC.

Kocak, J. New York City Department of Parks and Recreation Employee. Personal communication. September 1, 2011.

Konisky, D. 2011. Public preferences for environmental policy responsibility. *Publius: The Journal of Federalism* 41 (1): 76-100.

Konisky, D., J. Milyo, and L.E. Richardson. 2008. Environmental policy attitudes: Issues, geographical scale, and political trust*. *Social Science Quarterly* 89 (5): 1066-1085.

Kooiman, J. 2003. *Governing As Governance*. London: SAGE Publications.

Lemos, M.C. and A. Agrawal. 2006. Environmental governance. *Annual Reviews of Environment and Resources* 31:297-325.

- Leroux, K. 2007. Nonprofits as civic intermediaries: The role of community-based organizations in promoting political participation. *Urban Affairs Review* 42 (3): 410-422.
- Locke, D.H., J. M Grove, J.W.T. Wu, A. Troy, J.P.M O'Neil-Dunne, and B.D. Beck. 2010. Prioritizing preferable locations for increasing urban tree canopy in New York City. *Cities and the Environment* 3 (1): Article 4.
- Lockwood, M., J. Davidson, A. Curtis, E. Stratford, and R. Griffith. 2010. Governance principles for natural resource management. *Society and Natural Resources* 23 (10): 986-1001.
- Lohr, V.I., C.H. Pearson-Mims, J. Tarnai, and D.A. Dillman. 2004. How urban residents rate and rank the benefits and problems associated with trees in cities. *Journal of Arboriculture* 30 (1): 28-35.
- Lorenzo, A.B., C.A. Blanche, Y. Qi, and M.M. Guidry. 2000. Assessing residents' willingness to pay to preserve the community urban forest: A small-city case study. *Journal of Arboriculture* 26 (6): 319-325.
- Lovasi, G.S., J.W. Quinn, K.M. Neckerman, M.S. Perzanowski, and A Rundle. 2008. Children living in areas with more street trees have lower prevalence of asthma. *Journal of Epidemiology and Community Health* 62 (7): 647-649.
- Lu, J. W.T., E.S. Svendsen, L.K. Campbell, J. Greenfeld, J. Braden, K L. King, and N. Falxa-Raymond. 2010. Biological, social and urban design factors affecting youth street tree mortality in New York City. *Cities and the Environment* 3 (1): Article 1.
- McPherson, E.G., J.R. Simpson, Q. Xiao, and C. Wu. 2008. Los Angeles 1-Million tree Canopy Cover Assessment. United States Department of Agriculture, Forest Service, Pacific Southwest Research Station. General Technical Report PSW-GTR-207.
- McPherson, E.G. and F. Ferrini. 2010. Trees are good, but. *Arborist News* 19 (5): 58-60.
- Miller, K.W., L.B. Wilder, F.A. Stillman, and D.M. Becker. 1997. The feasibility of a street-intercept survey method in an African-American community. *American Journal of Public Health* 87 (4): 655-658.

- MillionTreesNYC. Getting to a Million Trees: Community and Private Sector Tree Planting Strategy. http://www.milliontreesnyc.org/html/million_trees/planting_strategy.shtml (accessed September 12, 2011).
- Moskell, C., S. Broussard Allred, and G. Ferenz. 2010. Examining motivations and recruitment strategies for urban forestry volunteers. *Cities and the Environment* 3 (1): Article 9.
- Mullins, R. and H. Fargo. 2008. Protecting and Developing the Urban Tree Canopy: A 135-City Survey. United States Conference of Mayors. www.usmayors.org
- New York City Department of Parks and Recreation. 2009. Park cut ribbon on improvements to Canarsie Park. www.nycgovparks.org/parks/B018/pressrelease/20841 Accessed 9/12/11.
- New York City Department of Health and Mental Hygiene. 2010. Updated hospitalization data by NYC neighborhood and income levels: 2000-2008. www.nyc.gov/html/doh/downloads/pdf/asthma/asthma-hospital.pdf Accessed 9/12/11.
- New York City Department of Planning 2010a. Brooklyn Community District 18 Profile. <http://www.nyc.gov/html/dcp/html/lucds/cdstart.shtml#sfl> Accessed 9/12/11.
- New York City Department of Planning. 2010b. 2006-2009 Comparison Demographic Profile. www.nyc.gov/html/dcp/html/census/popacs.shtml Accessed 9/12/11.
- New York City Department of Planning. 2010c. Queens Community District 12 Profile. <http://www.nyc.gov/html/dcp/html/lucds/cdstart.shtml#sfl> Accessed 9/12/11.
- Nowak, D.J., D.E. Crane, and J.C. Stevens. 2006. Air pollution removal by urban trees and shrubs in the united states. *Urban Forestry & Urban Greening* 4 (2006): 115-123.
- Ostrom, E. 2005. *Understanding Institutional Diversity*. Princeton, NJ: Princeton University Press.
- Perkins, H A. 2009. Out from the (green) shadow? Neoliberal hegemony through the market logic of shared urban environmental governance. *Political Geography* 28 (2009): 395-405.

- Pickett, S.T.A., M.L. Cadenasso, J.M. Grove, C.G. Boone, P.M. Groffman, E. Irwin, S S Kaushal, V Marshall, B P McGrath, and C H Nilon. 2010. Urban ecological systems: Scientific foundations and a decade of progress. *Journal of Environmental Management* 92 (2011): 331-362.
- Pierre, J and B G Peters. 2000. *Governance, Politics and the State*. New York, NY: St. Martins Press.
- Pincetl, S. 2010a. From the sanitary city to the sustainable city: Challenges to institutionalizing biogenic (nature's services) infrastructure. *Local Environment* 15 (1): 43-58.
- . 2010b. Implementing municipal tree planting: Los Angeles million-tree initiative. *Environmental Management* 45 (2010): 227-238.
- Rae, R.A., G. Simon, and J. Braden. 2010. Public reactions to new street tree planting. *Cities and the Environment* 3 (1): Article 10.
- Roman, L. 2006. Trends in street tree survival, Philadelphia, PA. Master of Environmental Studies Capstone Project, Department of Earth and Environmental Science, University of Pennsylvania.
- Schroeder, H. and P. Appelt. 1985. Public attitudes toward a municipal forestry program. *Journal of Arboriculture* 11 (1): 18-21.
- Schroeder, H.W. and S.R. Ruffolo. 1996. Householder evaluations of street trees in a Chicago suburb. *Journal of Arboriculture* 22 (1): 35-43.
- Sommer, R., F. Learey, J. Summit, and M. Tirrell. 1994. The social benefits of resident involvement in tree planting. *Journal of Arboriculture* 20 (3): 170-175.
- Still, D.T. and H.D. Gerhold. 1997. Motivations and task preferences of urban forestry volunteers. *Journal of Arboriculture* 23 (3): 116-129.
- Straka, T.J.M., A.P Childers, and J. Christopher. 2005. Individual characteristics affecting participation in urban and community forestry programs in South Carolina, US. *Journal of Arboriculture* 31 (3): 131-137.

- Svendsen, E.S. and L.K. Campbell. 2008. Urban ecological stewardship: Understanding the structure, function and network of community-based urban land management. *Cities and the Environment* 1 (1): Article 5.
- Swyngedouw, E. 2005. Governance innovation and the citizen: The janus face of governance-beyond-the-state. *Urban Studies* 42 (11): 1991-2006.
- Thompson, L. and R. Elling. 1999. Let them eat marblecake: The preferences of michigan citizens for devolution and intergovernmental service-provision. *Publius: The Journal of Federalism* 29 (1): 139-154.
- Tidball, K.G. and M.E. Krasny. 2011. Toward an ecology of environmental education and learning. *Ecosphere* 2 (2): Article 21.
- Treiman, T. and J. Gartner. 2005. What do people want from their community forests? Results of a public attitude survey in Missouri, US. *Journal of Arboriculture* 31 (5): 243-250.
- Vaske, J.J., J.A. Gliner, and G.A. Morgan. 2002. Communicating judgments about practical significance: Effect size, confidence intervals and odds ratios. *Human Dimensions of Wildlife* 7 (4): 287-300.
- Wells, N.M., G.W. Evans, and Y. Yang. 2010. Environments and health: Planning decisions as public health decisions. *Journal of Architectural Research and Planning* 27 (2): 124-143.
- Westphal, L.M. 2003. Urban greening and social benefits: A study of empowerment outcomes. *Journal of Arboriculture* 29 (3): 137-147.
- Young, R.F. 2011. Planting the living city. *Journal of the American Planning Association* 77 (4): 368-381.
- Zhang, Y., A. Hussain, J. Deng, and N. Letson. 2007. Public attitudes toward urban trees and supporting urban tree programs. *Environment and Behavior* 39 (6): 797-814.
- Zhang, Y. and B. Zheng. 2011. Assessments of citizen willingness to support urban forestry: An empirical study in Alabama. *Arboriculture & Urban Forestry* 37 (3): 118-125.

CHAPTER FOUR: INTEGRATING HUMAN AND NATURAL SYSTEMS IN COMMUNITY PSYCHOLOGY: AN ECOLOGICAL MODEL OF STEWARDSHIP BEHAVIOR

Abstract

Community psychology (CP) research on the natural environment lacks a theoretical framework for analyzing the complex relationship between human systems and the natural world. I review theory on coupled human and natural systems in the environmental sciences and suggest ways that community psychology can integrate this theory into the ecological perspective. Ecological models of behavior in CP have previously modeled health behaviors, but I believe that these frameworks are also applicable to environmentally sustainable behaviors. An increasingly relevant pro-environment behavior is the stewardship of vegetation and green spaces in cities and urban areas, especially since many cities across the United States are planting thousands of trees. Drawing from theory in community and environmental psychology, environmental science, and urban forestry, I propose an ecological model of urban forest stewardship behavior that includes factors at multiple ecological levels that may influence urban forest stewardship behavior. I also suggest ways that our model can inform the design and implementation of multi-level ecological interventions to promote urban forest stewardship behavior. Directions for future research are also discussed.

Introduction

Understanding the detrimental impacts of human activity on the natural environment is becoming an increasingly important research need, especially in light of global climate change and other serious environmental issues. Although community psychology (CP) shares similar values with the environmental movement (concern for well-being, social justice, power and oppression), only a few studies within CP have examined issues concerning the natural environment (Riemer 2010). Some CP studies have examined the dynamics of social power and the degree of citizen participation in community responses to local environmental hazards, such as toxic waste and nuclear power plants (Rich, Edelstein, Hallman and Wandersman 1995; Culley and Hughey 2008; Culley and Angelique 2011). These studies pointed to the need for genuine community involvement and citizen empowerment in environmental decision-making processes.

Other researchers have examined the environmental movement at the individual, organizational and macro-policy levels. Quimby and Angelique (2011) interviewed environmentalists about the catalysts and barriers they experienced in their efforts to live in an environmentally friendly manner. In interviews with practitioners of environmental organizations, Dean and Bush (2007) found that organizations use psychosocial processes in their work to promote conservation and institutional changes for environmental sustainability. At the macro-policy level, Browne and Bishop (2011) examined the perpetuation of psychological paradox, or competing interests, in natural resource management and sustainable development policy frameworks in Australia. Castro and Mauro (2011) investigated biodiversity legislation created by the European Union and how psychosocial processes were used in the adoption of the legislation at multiple levels of governance. These studies (Browne and Bishop 2011; Castro and

Mauro 2011) have highlighted how environmentally sustainable actions have manifested in various policy environments.

The body of CP research on natural environmental issues demonstrates a clear link between issues of community and issues of the environment. However, previous CP research suffers from underdeveloped theory on the relationship between humans and the natural world. This may be due in part to the exclusion of the natural environment from CP's ecological perspective (Reimer 2010; Riemer and Reich 2011). CP researchers Culley and Angelique (2011) note the importance of bringing the natural environment into the study of community, as environmental issues are often intertwined with issues of community function and well-being. More recently, Okvat and Zautra (2011) extended the definition of 'community' to include non-human species. Given these acknowledgements, I believe theory from environmental science about the reciprocal relationships between humans and the natural world can bolster future CP research on the natural environment.

In this article, I first review concepts from environmental psychology and environmental science on human-environment interactions to develop the theoretical basis for the inclusion of the natural environment in CP's ecological perspective. I also discuss how CP can both integrate and contribute to theory on the complex relationships between humans and natural ecosystems. Second, I apply these concepts to an environmental behavior—urban tree planting. I chose this example because many cities across the United States are currently planting trees to remediate the negative environmental effects of urbanization and global climate change (Mullins and Fargo 2008). I also chose this issue because more research is needed on ways to foster widespread citizen participation in urban forest stewardship in order to ensure that newly planted trees, and the health and environmental benefits that they provide, are sustained (Pincetl 2010a). I felt that

CP's ecological perspective provides a useful framework for examining the structural and contextual influences on urban forest stewardship behavior. Third, I present an ecological model of behavior that was created based on an extensive literature review of factors in the social, built and natural environment that may influence citizen participation in urban forest stewardship. I lastly suggest ways that my ecological model could be used to design and implement multi-level ecological interventions to foster citizen participation in urban tree planting and stewardship and to achieve individual and community level benefits.

Towards a Stronger Link between Humans and the Natural Environment in CP

Beyond Kelly's (1966) use of biological ecological principles to describe the structures (e.g. policies, procedures, events, settings) and processes (e.g. social actions and exchanges) of communities, there has been little consideration of natural environment within CP's nested ecological levels of analysis. In their description of an ecosystem, Levine, Perkins and Perkins (2005) include the biosphere, defined as "the larger inhabited environment, or the whole planet," (p. 127). Voorhees (2007) expanded Bronfenbrenner's (1979) ecological model and renamed the biosphere as the geosphere, defined as "the natural and social processes that transcend the traditional societal level of the macro-system," (Voorhees 2007, p. 24) (Voorhees 2007, p. 24) (Figure 4.1).

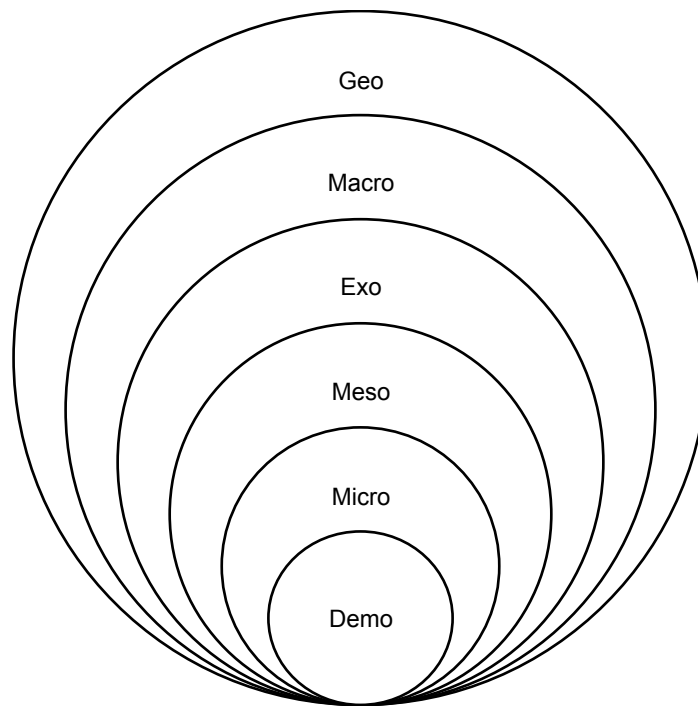


Figure 4.1: An ecological model that includes the natural environment in the geo-sphere (Voorhees 2007)

However, there has been little discussion of the theoretical underpinning for an explicit level for the natural environment to CP's ecological perspective. Like all nested levels of analysis in CP's ecological model, an outer ecological level for the natural environment (e.g. Figure 4.1) is an oversimplification of the complex relationships between humans and social and natural environments. Thus, this chapter seeks to describe some of the complexities that are encompassed within the natural environmental level to build the theoretical foundation for an explicit level for the natural environmental level within CP's ecological model.

Theory on coupled human natural systems (CHANS) in environmental science can provide the foundation for an explicit level for the natural environment within CP's ecological framework. CHANS are systems comprised of human and natural components that are linked in complex interactions (Liu et al. 2007). An example of a CHANS is a fishery, which contains

resource units (fish), users (fishers) and governance systems (fishing regulations). Interactions between these components produce outcomes at the socio-ecological systems level (Ostrom 2009). Reciprocal relationships between humans and the natural environment create complex feedback loops that are manifested in CHANS (Liu et al. 2007). For instance, human consumption of a natural resource can deplete supplies of that resource in ways that alter natural ecosystems, but government regulations can be implemented to sustainably manage the supply of the resource. Characteristics of a natural resource ecosystem, such as the size, productivity and predictability of a system, have been found to influence collective human action to invest in governance systems to manage the natural resource (Ostrom 2009). If CP further examines issues concerning the natural environment, a basic understanding of natural ecological principles, and recognition of the complexity of CHANS, will be needed. The ecological framework in CP holds potential for examining structures and processes at the individual and community levels that CHANS models in the environmental sciences have failed to include (Riemer 2010). For example, models of CHANS for urban ecosystems have tended to lump human activities into one aggregate variable (Alberti et al. 2003). However, CP's systems view of communities and social settings can help to illuminate the complexity of the structures and processes in human systems, as well as their outcomes for the natural environment, that CHANS researchers have overlooked.

Ecological models of behavior (EMBs) are a specific type of socio-ecological framework that illustrates factors that promote or hinder behavior at multiple ecological levels of analysis. EMBs identify the factors in physical and social environments that interact with individual attributes (e.g. socio-economic status) to influence a specific domain of human behavior (Sallis and Owen 2002). Ecological models of behavior serve as frameworks for the design and implementation of multi-level interventions (MLEIs) that introduce alterations or changes in the

social and physical environments (e.g. home, school, workplace) that promote positive behavior change among individuals. MLEIs are designed to introduce changes at multiple levels that will develop community capacity and mobilize community resources that are necessary for desired behavior change for a specific health issue (Schensul 2009; Trickett 2009). Ultimately, the goal of MLEIs is to create “health promotive” environments (Sallis and Owen 2002) that encourage individuals to engage in healthy behaviors. MLEIs have been shown to effect positive health behavior changes in STD prevention (e.g. DiClemente et al. 2007) and tobacco control (e.g. Sallis and Owen 2002). In CP, EMBs and MLEIs have been AIDS prevention, physical activity and violence prevention (see Lounsbury and Mitchell 2009).

Since EMBs and MLEIs have been successful for effecting health behavior change, we believe they are applicable to pro-natural environmental behaviors. After all, actions to promote the health of the natural environment can produce health related outcomes for humans. For example, environmental stewardship increases people’s exposure to nature and to the health benefits it provides (see Frumkin 2001). Stewardship can also leverage additional health benefits because it requires physical activity (Pillemer, Fuller-Rowell, Reid and Wells 2010). Although EMBs are traditionally used in the context of health behavior, EMBs focused on pro-environmental behaviors are needed to better understand the factors at multiple levels that foster and hinder environmentally sustainable behavior. Since EMBs have been successful for designing behavior change interventions in public health (see Sallis and Owen 2002), they may also be effective for designing interventions for environmental sustainable behaviors.

An increasingly relevant pro-environmental behavior is the stewardship of trees and green spaces in cities and urban areas. Trees provide a wide range of valuable, ecological services to cities, such as air and water quality, climate protection and biodiversity (see

McPherson 2006) but little knowledge exists about how to foster the types of behavior among the general public that is needed to sustain urban trees and green spaces (Pincetl 2010a). Urban forest stewardship is defined as providing basic care to trees (e.g. watering and pruning trees). An EMB of urban forest stewardship may provide insight into how to foster citizen participation in stewardship.

In the next section, I will provide background on urban forestry, the benefits of urban trees and the role of citizen stewardship of urban trees.

Urban Forestry and Urban Tree Planting

Urban forestry is the management of trees in urban areas for the human health and environmental benefits they provide (McPherson 2006). Urban trees can be found in parks and natural areas in cities and urban areas, but also in planting beds along sidewalks and in street medians. The natural environmental benefits of urban trees include improved water quality (Nowak et al. 2007) and the removal of air pollution (Nowak et al. 2006). Urban forests can also reduce urban air temperature by providing shade, which results in the secondary outcomes of energy conservation and the reduction of smog (Akbari et al. 2001). Urban trees also produce a wide range of human health benefits. Window views of nature have been associated with an improved ability to recover from mental fatigue and to improve attention capacity (Tenessen and Cimprich 1996). The presence of trees and green spaces near residential areas has been associated with reduced feelings of aggression (Kuo and Sullivan 2001), increased feelings of safety and a sense of belonging to community (Kuo et al. 1998) and a heightened sense of personal well-being (Kaplan 2001). Nature also provides benefits to children, including improved cognitive functioning (Wells 2000) and a better ability to cope with stressful life

events (Wells and Evans 2003). Faber Taylor, Kuo and Sullivan found a significant relationship between access to nature from the home and self-discipline for young girls growing up in the inner city. The presence of trees and green spaces in urban residential areas also produces community level benefits. Residents gather more frequently in green spaces outside apartment buildings than in barren, non-vegetated areas (Coley et al. 1997). Green spaces provide places for residents to interact in ways that fosters the development and strengthening of social ties between residents (Kuo et al. 1998; Sullivan et al. 2004).

Large-scale tree planting initiatives are underway in many cities across the United States such as New York City and Los Angeles (the two most populous cities in the United States) and also in Houston, TX, Denver CO, and Sacramento, CA (Young, 2011; Pincetl 2010b). Local government typically manages urban forests, but municipalities have become increasingly reliant on non-profit organizations, community groups and citizens to maintain newly planted trees (Svendsen and Campbell 2008; Pincetl 2010a). There is a need to better understand the constraints on urban forest stewardship behavior in the settings where trees are planted. An EMB of UF stewardship can depict the factors in the urban built environment where trees are planted that promote or hinder stewardship.

Proposed Ecological Model of Stewardship

In this section, I propose an ecological model of urban forest stewardship that identifies the structural and contextual factors that support or hinder urban forest stewardship behaviors in various settings (Figure 4.2). Our model follows the nested levels of Bronfenbrenner's (1979) ecological model in that factors at the individual level are mapped at the center of the model. Seven other environments in which the individual is nested are also depicted (Table 4.1).

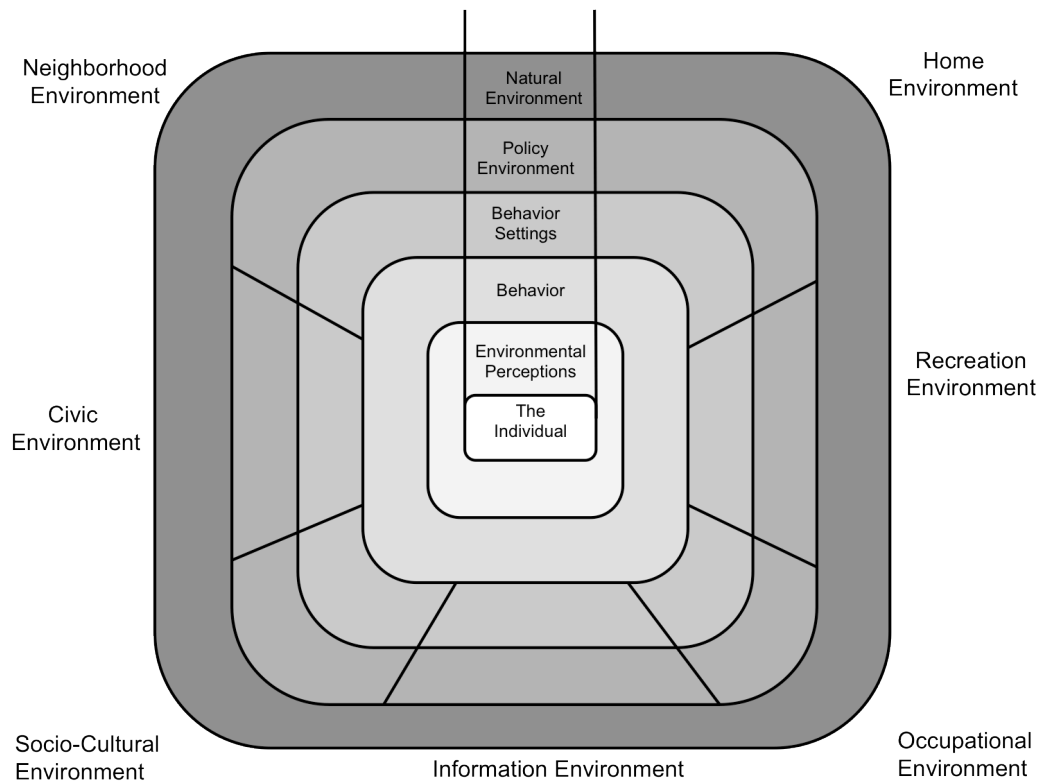


Figure 4.2: Basic outline of ecological model of urban forest stewardship. The framework of the proposed ecological model of urban forest stewardship will contain intrapersonal and interpersonal factors in seven environments relevant to urban forestry and that are hypothesized to influence an individual's engagement in urban forest stewardship. Model is adapted from Sallis et al.'s (2006) ecological model of active living.

Table 4.1

Description of Environments in the Ecological Model of Urban Forest Stewardship

| Environment | Description |
|----------------|--|
| Home | The territory in and adjacent to a person's home dwelling |
| Neighborhood | Elements of the human built-environment |
| Recreation | Facilities and social groups for recreation, exercise, and physical activities, etc. |
| Civic | Organizations and institutions that operate at the community and government level |
| Information | Information and public knowledge about urban forest stewardship |
| Occupational | Places where people pursue their job or profession |
| Socio-cultural | Social units that prescribe patterns of behavior for different social groups |

These environments were chosen based on locations where urban trees can be planted (e.g. parks, school grounds, back yards) and thus, each environment contains factors that can influence stewardship behavior. Each of these environments contains factors that can influence stewardship behavior. For example, the home environment entails the territory in an adjacent to a persons' residence, which may or may not include outdoor property where urban trees can be planted. The neighborhood environment encompasses the built infrastructure of a person's neighborhood, such as sidewalks, vacant lots, rights of way (street medians) and urban parks.

The recreation environment includes facilities and groups (e.g. sports teams) that host recreational activities in the community. The civic environment includes organizations and institutions that operate within the neighborhood; these organizations may be in the civil society sector (non-profit organizations, civic associations, informal grassroots groups) or in the public sector (e.g. the local municipal Parks department). The information environment includes sources of public information in mass media, such as print publications (e.g. newspapers) or internet webpages. The occupation environment includes places where people pursue their daily profession, such as workplaces and schools. Lastly, the socio-cultural environmental encompasses social norms, values and culture related to urban forests and stewardship. Elements in all of these seven environments can be acted upon (via an intervention) to promote urban forest stewardship behaviors. For example, each environment contains behavior settings for stewardship that will be described in the following sections.

Because our model (Figure 4.2) is focused on a behavior that involves and affects the natural environment, both the natural ecological principles and CP ecological principles of interdependence, succession, cycling of resources and adaptation are at play. From a CHANS perspective, interdependence manifests through feedback loops between humans and natural

systems (Liu et al. 2007). For example, municipal tree planting strategies in the policy environment (human system) can determine the quantity of trees planted in the natural environment (natural system). Interdependence is also present within the model because factors in certain environments may interact with factors in other environments. For instance, cultural values in the socio-cultural environment may influence landscaping practices conducted in the home-environment (see Fraser and Kenney 2000). Other factors, however, may be unique to a specific setting (e.g. land use regulations). In the proposed model (Figure 4.2), the natural environmental level of the ecological model is not delineated separately because human systems are ultimately dependent upon and intertwined with natural resources (Adger 2000).

The ecological process of cycling of resources is also present within the model. In a natural urban forest system, resources (e.g. water, nutrients) cycle through the biological populations and components of the ecosystem. Trees and other natural organisms adapt to changes in their environment, such as those due to human activity. In human systems, resources exist at individual and community levels. Individuals have information, qualities and skills that can be exchanged and cycled through community level resources, such as groups, procedures and events (Kelly et al. 2000). Adaptation is present within the model because participants in human systems will adapt to changes in their external environment (Kelly et al. 2000), just as natural organisms adapt in their natural environmental systems. In CP, succession refers to human system change over time, which can influence future efforts to change the system (Kelly et al. 2000). Succession in urban forests entails the natural ecological composition (species, size, distribution, etc.) of the ecosystem over time.

In the following sections, I will describe the specific components within each environment and level of the model. First, I will describe urban forest stewardship behaviors,

which are the intended outcomes of efforts to engage stakeholders in urban forestry activities.

Next, I will describe the behavior settings, policy environment and natural environment. Last, I will describe the intrapersonal levels of the model: individual and environmental perceptions.

Urban Forest Stewardship Behavior

I propose three domains of stewardship behaviors (passive, active, civic) that support sustainable urban forest management and as such, are defined in the behavior level of the model (Figure 4.2; Table 4.2).

Table 4.2

Description of Three Domains of Urban Forest Stewardship Behavior

| Domain | Behavior | Definition |
|---------|-------------------------------|--|
| Passive | Learning about urban forestry | Gaining knowledge of the benefits trees provide; Becoming informed about local urban forestry programs and current tree planting activities |
| | Use of treed spaces | Spending time or recreating in areas that are planted with trees |
| Active | Basic tree care | Providing basic care to trees. Actions include watering trees, weeding and mulching tree planting beds, pruning tree branches, removing litter from the planting bed, posting signage near the tree, monitoring trees for damage and disease |
| | Planting trees | Involvement in neighborhood tree planting activities; planting trees on private property |
| Civic | Political support | Civic engagement activities (e.g. voting, fundraising) in support of public policies that endorse urban forestry activities |
| | Participation in planning | Becoming involved in urban forest planning processes with other stakeholders |

The “passive stewardship” domain entails behaviors that do not require physical interactions

with trees (e.g. learning about trees in a classroom), but that may contribute to a person's general awareness of urban trees. Urban residents tend to have many passive interactions with trees, such as viewing them through an apartment or office building window (Westphal 2003). Spending time in places with trees is also included as form of stewardship because previous research suggests that childhood and adulthood exposure to nature can foster pro-environmental behaviors (e.g. Wells and Lekies 2006; Larson, Whiting and Green, 2011). The "active stewardship" domain includes actions that require more physical interaction with trees, such as watering or pruning trees.

"Civic stewardship" includes behaviors that are similar to formal civic engagement activities, such as demonstrating political or financial support for urban forestry programs (e.g. Zhang, Hussain, Deng and Letson 2007). My conceptualization of civic stewardship draws from civic environmentalism in that it emphasizes collaboration and deliberation among various community stakeholders and policy-makers and directly engaging residents in problem solving and decision-making processes regarding the local urban forest ecosystem (Sirianni and Friedland 2001). The types of activities defined within the three stewardship domains (Table 4.2) are much broader in practice, for there are numerous ways in which people learn about urban trees (passive stewardship), partake in tree planting and tree care activities (active stewardship), and participate in civic and political activities in their communities (civic stewardship). In the context of this article, I divided the numerous types of stewardship actions into three domains in order to broadly refer to urban forest stewardship in presenting the proposed ecological model. Passive, active, and civic stewardship can occur in multiple environments (home, neighborhood, civic, recreation, occupational, social-cultural, information). For example, people may learn about urban forestry (passive stewardship) in the school environment, or during community

meetings in the civic environment. Also, residents can provide basic care to trees (active stewardship) in their home and neighborhood environment.

Behavior Settings

Behavior settings are the social and physical situations in which human behavior occurs (Sallis and Owen 2002). According to Barker’s (1968) behavior setting theory, the social and physical aspects of behavior settings are synomorphic and coincide to generate “forces” that shape people’s behavior within the setting, regardless of the individuals present in the setting. For example, a lecture hall has a podium that allows a lecturer to address the audience, and the room has seats that face the lecturer. Thus, settings contain physical and social attributes that support and discourage certain behaviors to occur there (Barker 1968). There are multiple behavior settings for urban forest stewardship (Figure 2; Table 4.3).

Table 4.3

Behavior Settings for each of the environments in the Ecological Model of Urban Forest Stewardship

| Environment | Behavior Settings |
|----------------|--|
| Home | Front and back yard, gardens, type of residence |
| Neighborhood | Sidewalks, rights of way, vacant lots, physical resources (e.g. tools) |
| Recreation | Parks, park facilities, sports teams |
| Civic | Organizations in the public and private sector |
| Information | Internet, mass media, print publications |
| Occupational | School yards, business properties |
| Socio-cultural | Norms, values, culture, social capital |

Behavior settings also contain structures, defined as opportunities for interaction with social, physical or institutional components of the system (Kelly et al. 2000). Structures are created,

altered or acted upon through ecological processes within the system (adaptation, cycling of resources, succession, and interdependence).

Behavior settings are self-regulated and maintained by circuits. Goal circuits are the purpose of the setting (e.g. lecturing), which help individuals decide whether or not their personal goals will be fulfilled by participating in the setting. Program circuits are the activities that are the means through which the goal of the setting will be met (e.g. a meeting agenda). Deviation circuits correct inappropriate behavior and vetoing circuits eliminate elements within the system that are not functioning correctly (Barker 1968). Individuals act upon and are themselves acted upon by the behavior setting (Barker 1968). A mechanism that operates within behavior setting circuits is the number of participants who are present (manning) the setting. Settings are optimally manned when the number of people within the setting is equal to the number of roles that exist within the system. When the ratio of participants to roles is not equal within a setting, the setting does not operate or maintain itself smoothly (McLaren and Hawe 2005).

Structures for stewardship within the behavior setting level of the model would include the physical locations where interaction with the natural environment can occur in the form of stewardship, such as sidewalks, rights of way (i.e. street medians) and vacant lots. Other structures for stewardship include the physical resources for stewardship that are available within the setting, such as water, hoses and buckets, and mulch, for example (Johnson et al. 2010). I will illustrate examples of the social, physical and institutional structures within the behavior setting level of different environments of the model.

In the home and neighborhood environment, trees may be planted in the front or back yards of a home or apartment building, or along the sidewalk adjacent to the property. If the area

where these trees are planted are busy with other people moving through the area (children playing, people walking) or there is heavy automobile traffic on the nearby street, people may not feel comfortable or safe providing basic care (e.g. pruning) to the trees. Moreover, street trees require 15-20 gallons of water per week (Johnston et al. 2010), but there may be no access to water or hoses from the yard or sidewalk and residents may not be willing or able to carry buckets of water from indoors out to the trees. Thus, the physical design and physical resources available in a setting will determine the degree to which stewardship behavior conforms to the setting.

Institutional structures for stewardship would include local municipal departments, non-profit urban forestry organizations, community groups and schools involved in urban forestry activities. These structures may facilitate stewardship behavior by providing social support. Recent studies have shown that there are a large number of active urban forestry and environmental stewardship groups in large cities, such as New York and Seattle (Svendsen and Campbell 2008; Wolf et al. 2011). Events and programs hosted by these organizations may encourage engagement in stewardship by providing social support for involvement in urban forestry activities. Numerous studies have identified the opportunity for social interaction during tree planting and stewardship activities as a motivation for volunteers who participate in these programs (Still and Gerhold 1997; Moskell, Allred and Ferenz 2010). In the recreational environment (e.g. parks) and the neighborhood environment (e.g. city streets, vacant lots), citizen groups or the local municipal urban forest management department, may host tree planting days in which volunteers and community members plant trees (see Summit and Sommer 1998 and Moskell et al. 2010). Also in the neighborhood environment, there may be local “Citizen Pruners,” tree monitors or neighborhood tree captains who serve as leaders and role models for

tree planting and stewardship in their community (Schwab 2009; Boyce 2010). In the occupational environment, there may be groups of students, parents and teachers involved in landscaping projects on school grounds, or groups of employees volunteering to landscape the area outside of their own office (see Kaplan 2007).

While these types of social structures can foster stewardship behavior, there may be other social aspects within behavior settings that prevent or discourage stewardship behavior. Take the example of a volunteer event that aims to plant trees in a local park; the event is organized and hosted by a “Friends of the Park” group and the group has received 100 trees to plant within the park. Ideally, the event will be optimally manned such that there are 50 pairs of volunteers and each pair plants 2 trees. However, if more people attend the event than the organizers expected, there may not be enough activities to keep the volunteers engaged in planting activities for the entire time. On the other hand, if only a few volunteers attend the event, then those volunteers may have to work harder and more quickly to ensure that all of the trees get planted by the end of the event. Thus, ensuring that volunteer events and other stewardship activities are optimally manned may maximize the beneficial outcomes that participants derive from the behavior settings.

Policy Environment

The policy environment includes the macro-level policies and policy tools that regulate or provide incentives for stewardship behaviors within behavior settings (Figure 3; Table 3). For example, policies about park use in the recreation environment dictate how people can use park facilities, such as playgrounds or sports fields. Similarly, the mission and budget of a non-profit

organization or a government agency shapes the work they can do within the specific behavior settings where they operate within the community. In workplaces in the occupational environment, businesses may have employee programs that encourage volunteerism by hosting volunteer events or that award release time for employees to volunteer in urban forestry projects in their community (see Bowen et al. 2009) In the home and neighborhood environments, some residents may live in buildings or communities that are landscaped by contractors, which may prevent residents from being involved in maintaining the trees on the property. Similarly, apartment tenants may have a lease or contract that prevents them from planting trees or other greenery outside of their apartment.

Local government policies that guide tree-planting practices may also promote or discourage residents' involvement in tree planting and stewardship in the neighborhood environment. In many cities, the decision to plant trees on public property in residential areas is often made at the local governmental level, and thus, residents may not be directly consulted before trees are planted outside of their property (Pincetl 2010a). Some residents may have negative attitudes toward street trees because of the problems caused by trees on or near their property, such as falling leaves and cracked sidewalks (McPherson and Ferrini 2010). Thus, some residents may perceive street tree-plantings as unfair because of the financial and legal burden of maintaining the trees (Rae, Simon and Braden, 2010). Furthermore, the lack of public involvement in street tree plantings may also cause residents to view the entities who planted the trees to be responsible for maintenance and consequently, residents may not recognize themselves as playing a role in providing basic care to trees. Due to some of these issues, many residents have voiced complaints about newly planted street trees in New York City (Rae et al. 2010) and in Los Angeles (Pincetl 2010b).

A lack of citizen participation in urban forest planning and tree planting can lead to a lack of support and acceptance of the trees, and thus, perhaps an unwillingness to take care of the trees. Sommer, Learey, Summit and Tirrell (1994) found that residents who were involved in the planting of trees outside their home were more satisfied with the trees than were residents who had been uninvolved. Thus, municipal tree planting policies that allow for resident participation in the decision to plant trees, and in actual tree planting activities, may be more likely to foster stewardship than top-down policies.

The Natural Environment

The reciprocity between humans and the natural environment in that the natural world can motivate people to steward natural resources and create positive outcomes for the natural environment (Figure 4.3). Studies on environmental volunteerism have revealed how aspects of the natural environment can motivate humans to engage in stewardship. Fascination with the natural world has motivated people to partake in stewardship projects so that they can explore and learn about nature, as well as to protect biodiversity and natural habitats (Miles, Sullivan and Kuo, 1998; Grese, Kaplan, Ryan and Buxton, 2000; Ryan, Kaplan and Grese, 2001). The ecosystem services provided by the urban forest, and the need for more urban trees, have also served as motives for people to volunteer in urban forestry activities (Moskell et al. 2010). Many volunteers have reported that they enjoy spending time outside and that the opportunity to do so is a significant motivation for their participation in environmental volunteerism opportunities (Grese et al. 2000; Miles et al. 1998; Ryan et al. 2001; Moskell et al. 2010).

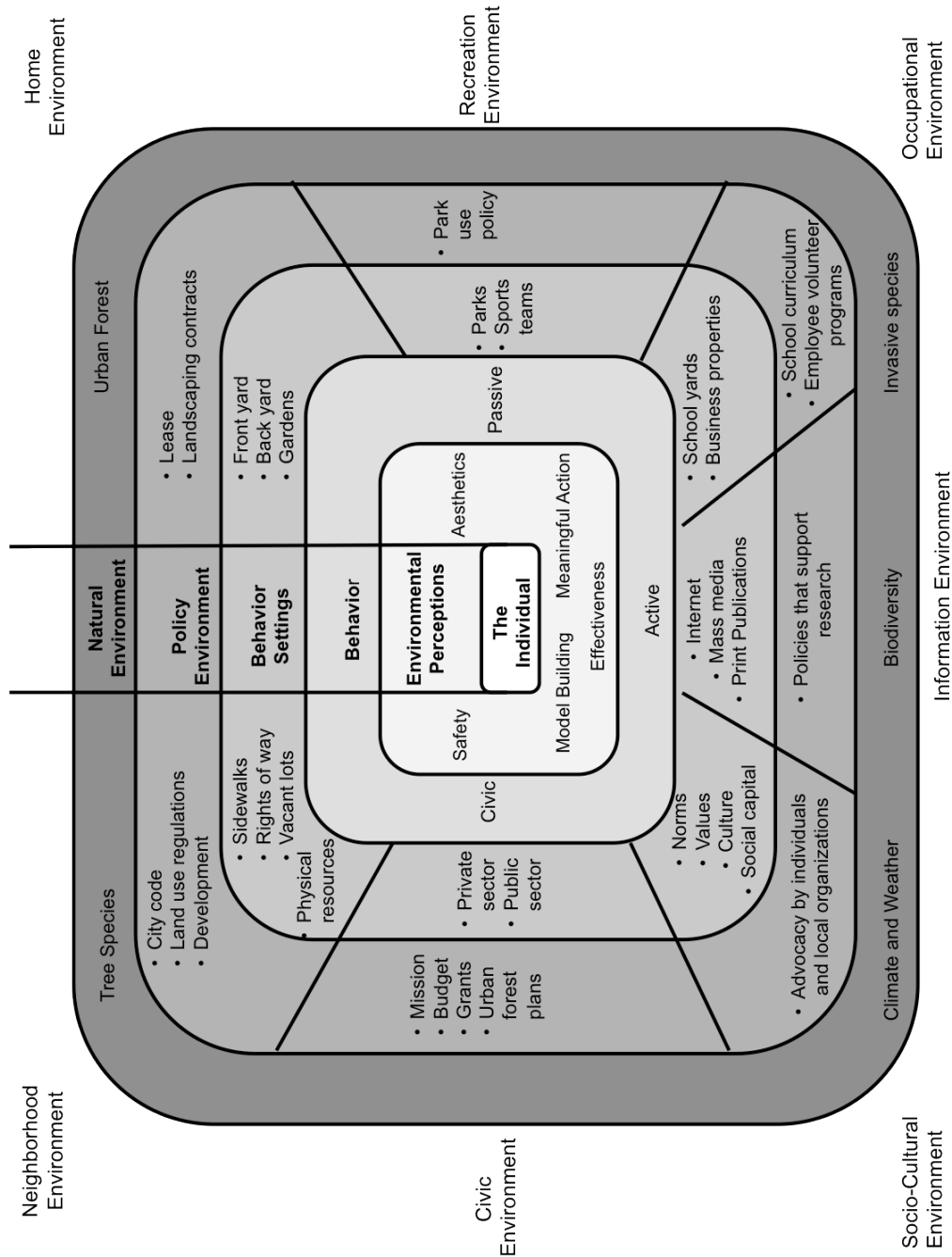


Figure 3: Proposed Ecological Model of Urban Forest Stewardship. The proposed ecological model of urban forest stewardship depicts factors at multiple levels that will interact with individual level attributes to influence urban forest stewardship

The natural environment overlaps with the socio-cultural environment because specific trees or tree species can be symbols of spiritual and cultural values. Trees are often planted in celebration or commemoration of an important life event (e.g. the birth of a child or other historical moment) (Jones and Cloke 2002) or to counteract the negative environmental and social impacts of a natural disaster. Many citizens in New Orleans planted trees following Hurricane Katrina. Not only did the tree planting efforts serve to replace trees that were damaged in the storm, but the act of tree planting served to rebuild communities and were a symbol of starting anew for many residents. The newly planted trees also reminded residents what New Orleans' neighborhoods looked like before the hurricane. Thus, stewardship serves as a way to protect and enhance the values and memories symbolized by trees (Tidball, Krasny, Svendsen, Campbell and Helphand, 2010).

Other natural ecological threats to trees, such as invasive species, can also motivate people to protect urban forest health. The emerald ash borer (EAB) is an invasive non-native insect species that kills native ash trees and poses an ecological threat to urban forests. EAB was first discovered in Michigan in 2002 and has since spread to other states (Poland and McCullough 2006). EAB's threat to ash trees prompted New York State to create a statewide EAB Awareness Week in May 2011. As part of this initiative, volunteers tied colorful ribbons and tags around 3,000 ash trees to notify residents about how to monitor the trees for signs of EAB infestation (Department of Environmental Conservation, 2011). Just as fascination with nature can motivate people to plant trees, ecological threats to nature posed by invasive species can also encourage people to partake in stewardship.

I have focused thus far on the ways that the natural environment can motivate people to participate in stewardship, but it is also necessary to consider how human activity can impact the

natural environment. Urban forest stewardship can have positive impacts on urban forest ecosystems because human interventions such as watering and pruning trees can extend the life span of an urban tree. Empirical evidence for the positive relationship between urban forest stewardship and urban forest health was demonstrated in New York City. Lu and others (2010) found that New York City street trees that exhibited evidence of stewardship (e.g. weeding, signage, etc.) had a significantly lower rate of mortality than trees that did not exhibit signs of stewardship. In this case, human action appears to sustain urban trees. Thus, the natural environment level of the ecological model of stewardship behavior considers human action to have positive impacts on the natural environment. I will now review the intrapersonal levels of the model: individual and environmental perceptions.

Environmental Perception

The environmental perception level of the model (Figure 3) is drawn from the Reasonable Person Model (RPM), an environmental psychology theory of human cognition, motivation and behavior (Kaplan and Kaplan 2009). The premise of the RPM is that “people are more likely to be reasonable in environments that support their informational needs,” and in environments that “elicit and foster the positive side of human nature,” (p. 330). “Reasonable” behaviors include cooperation, constructive activity and civility. When a person’s informational needs are met, they are more likely to be reasonable. A person’s informational needs comprise the three components of the RPM: model building, meaningful action and effectiveness (Kaplan and Kaplan 2009).

Model building, the first component of the RPM, refers to the construction of cognitive

maps or mental models that are pictorial and semantic images of the content and arrangement of places (Gifford 1997). The process of model building is important for navigating through environments. Humans have a basic informational need to understand and to explore environments (Kaplan and Kaplan 1989). Thus, humans prefer environments that are not confusing and that appear navigable (i.e. that make sense) and that offer the potential for acquiring more information (i.e. that allow for exploration) (Kaplan and Kaplan 1989). Understanding and exploration are the vehicles through which people expand their cognitive maps, which are important for predicting their actions within an environment (Kaplan and Kaplan 2009). Furthermore, individual decisions to enter into an environment may be based on judgments about the safety or aesthetics of a setting (Gifford 1997). Model building is important in the context of urban forestry because people may need to build new mental models of the appearance of their street or community after new trees are plant, as well as models about the tree planting and tree care process.

Humans are able to attend to model building when they are able to engage in the second component of the RPM, “meaningful action” or participation within their environment (Kaplan and Kaplan 2009). Meaningful action refers to people’s need “to make a difference, to be needed and to participate with their fellow humans in achieving goals,” (p. 331). A person can engage in meaningful action in many ways, such as voting or volunteering. “Meaningful action” also requires a person to be heard and respected by others (Kaplan and Kaplan 2009). Urban forest stewardship is a form of meaningful action because it entails people taking efforts to enhance and protect the natural resources in their community. However, people may be more likely to engage in stewardship in environments and settings that offer the opportunity for meaningful action. A study by Moskell et al. (2010) suggests that stewardship opportunities may be more

apparent to volunteers in more densely vegetated environments than in built environments. The authors found that some volunteers perceived that trees offered opportunities for stewardship only in parks; no volunteers reported that trees provide opportunities for stewardship in residential neighborhoods (Moskell et al. 2010). Thus, some people may associate stewardship with large stands of trees or forested areas, and may not find meaningful action with stewardship in trees in more sparse settings such as those planted along the sidewalks in their neighborhood.

The third component of the RPM is “effectiveness,” which refers to people’s need to effectively manage information (Kaplan and Kaplan 2009). Humans have a need to be clear-headed and competent as they process information in their environment so that they can achieve their goals. Constant information processing requires a great amount of effort and directed attention. Over time, directed attention tires, at which point a person will experience mental fatigue. Recovery from mental fatigue is important for achieving clear-headedness, or the ability to effectively process and manage information about the environment. Achieving clear-headedness can foster competence, or the sense of “knowing how things work in the world and knowing what is possible,” (Kaplan and Kaplan 2009, p. 332). Competence is important for facing the challenges of everyday life, and being able to process the information in the environment can provide a person with the sense that they know how to function in face of a challenge. Planting and caring for trees can lead to effectiveness. A large body of empirical research has found that viewing natural settings (e.g. landscapes, images of vegetation, etc.) engages involuntary attention, thereby allowing directed attention to rest and to restore (see Berman et al. 2008 for a review). Thus, tree planting increases people’s exposure to nature and to its attention restorative qualities.

Aspects of environmental perception also interact with individual level attributes (Figure

3). For example, people's desire to engage in meaningful actions to steward trees may be shaped by their attitudes toward trees. Residents who believe that trees improve their quality of life are more likely to rate the benefits of trees higher than people who do not believe trees contribute to quality of life (Lohr, Pearson-Mims, Tarnai and Dillman 2004). Holding a positive view toward trees may be a precursor for volunteering to take care of trees while allergies may discourage people from taking care of trees. Thus, individual attributes, such as beliefs, values and attitudes, will shape how a person perceives trees and their stewardship behavior.

Our proposed ecological model presents factors that influence people's engagement in urban forest stewardship (Figure 4.3). The model serves to demonstrate how the natural environment can be integrated into an ecological model of behavior. In the following section, I will discuss how our ecological model can inform the design of interventions to foster public engagement in stewardship.

Implications for Multi-level Ecological Interventions

EMBs (Figure 4.3) can inform the development of multi-level ecological interventions (MLEIs) for behavior change. MLEIs are designed to introduce changes at multiple levels (e.g. home, neighborhood, policy, etc.) that will develop community capacity and mobilize resources that are necessary for a desired behavior change (Schensul and Trickett 2009). Interventions can be comprised of both passive and active components; active interventions exert direct influence on an individual to make a behavior change whereas passive interventions indirectly encourage behavior change through alterations made to the environmental surroundings (Stokols, Grzywacz, McMahan and Phillips, 2003). Conceptualizing large-scale tree planting initiatives as MLEIs can bring attention to the multiple types of environments (home, neighborhood, etc.) and

settings (sidewalks, school yards, media, etc.) that contain structural and contextual factors that can influence people's stewardship behaviors. Tree planting campaigns are often introduced on just a few levels within these environments, such as in the natural areas of parks or in planting beds along sidewalks in a residential neighborhoods. But, elements of tree planting campaigns must also be introduced into the other environments in order to become embedded within communities in a manner that is meaningful and culturally relevant. Take the informational environment, for example. Although many tree planting initiatives have marketing campaigns, information about tree planting activities is often not effectively communicated to residents. In New York City for example, residents in some neighborhoods are only notified about street tree planting activity on their block by posters hung up in public places by the Parks Department (Rae et al. 2010.)

Since residents are often excluded from the planning and planting of street trees in urban residential areas (Pincetl 2010a), residents may not understand why trees are being planted in their neighborhood. Furthermore, many residents' perceptions of trees may be informed by previous negative experiences with the problems caused by trees (e.g. falling leaves, cracked sidewalks). Thus, communication with residents must go beyond simply informing them of tree planting activities in order to expand people's mental models of urban trees to also include the benefits and positive aspects of urban trees. Information about tree planting campaigns that avoids jargon, uses imagery and stories and that relates information to people's existing knowledge about and positive experiences with trees may facilitate mental model building in a manner that nurtures people's attachment to newly planted trees (Phalen 2009).

Using a multi-level ecological intervention approach to tree planting could lead to the manifestation of passive, active and civic forms of stewardship in multiple environments. Many

large-scale tree planting initiatives tend not to include passive interventions that alter the built environment around the trees to make it easier for people to engage in stewardship, for example by providing a ground-level source of water. Another passive intervention could include the creation of a community toolshed where residents could rent the equipment needed to steward the trees on their property or in their community. Active interventions to promote stewardship can be implemented at the macro-policy level by involving adjacent property owners in the municipal tree planting process. This intervention at the macro-policy level can also fulfill the meaningful action component of the RPM by ensuring that urban forest managers hear people's desires and concerns related to trees. Increasing citizen participation in urban forest planning and tree planting can reveal local knowledge about the settings in which trees will be planted, such as the existing types of activities that could be displaced by newly planted trees (Hawe et al. 2009). Stakeholder and community engagement in the design and implementation of interventions can help to ensure that interventions become embedded within the community context and are culturally situated (Trickett 2009).

Conclusions and Future Research

In this article, I have addressed some of the theoretical issues pertinent to the inclusion of the natural environment within CP's ecological perspective. By integrating theory on CHANS, I emphasized the reciprocal relationship between humans and the natural environment. I presented an ecological model of urban forest stewardship behavior to illustrate the multiple factors within different environments (recreation, home, etc.) that influence urban forest stewardship at the intrapersonal level (individual attributes and environmental perception) and in the behavior settings, policy environment and natural environment. In developing an ecological model of

behaviors that involve and affect the urban forest, I have demonstrated one way in which the natural environment can be integrated into further CP research on the natural environment.

I suggest that future CP research on environmental issues look to theory on human-environment interactions in other academic disciplines, including environmental psychology and the environmental sciences. CP is well positioned to contribute to existing theory on the complex relationships between humans and the environment. CP's systems view of communities can shed light on the structure and processes within communities that CHANS research has not fully captured. Although our ecological model captures some of the complexity between human and natural systems, future research is needed to validate our ecological model of urban forest stewardship, including the specific ways that the elements in each of the environments of our model promotes or hinders engagement in stewardship. Nevertheless, I believe that this ecological model provides a guiding framework for future theoretical refinement on the inclusion of the natural environment into CP's ecological models and ultimately, on theory and design of MLEIs to promote environmentally sustainable behaviors on both individual and collective levels.

REFERENCES

- Adger, W. N. (2000). Social and ecological resilience: Are they related? *Progress in Human Geography*, 24(3), 347-364.
- Akbari, H., Pomerantz, M., & Taha, H. (2001). Cool surfaces and shade trees to reduce energy use and improve air quality in urban areas. *Solar Energy*, 70(3), 295-310.
- Alberti, M., Marzluff, J. M., Shulenberger, E., Bradley, G., Ryan, C., & Zumbrunnen, C. (2003). Integrating humans into ecology: Opportunities and challenges for studying urban ecosystems. *Bioscience*, 53(12), 1169-1179.
- Barker, R. G. (1968). *Ecological psychology: Concepts and methods for studying the environment of human behavior*. Palo Alto, CA: Stanford University Press.
- Berman, M. G., Jonides, J., & Kaplan, S. (2008). The cognitive benefits of interacting with nature. *Psychological Science*, 19(12), 1207-1212.
- Bowen, G., Burke, D.D., Little, B.L., & Paul, H.J. (2009). A comparison of service-learning and employee volunteering programs. *Academy of Educational Leadership Journal*, 13(3), 1-18.
- Boyce, S.E. (2011). It takes A stewardship village: Is community-based urban tree stewardship effective? *Cities and the Environment*, 3(1), Article 3.
- Bronfenbrenner, U. (1979). *The ecology of human development: Experiments in nature and design*. Cambridge, MA: Harvard University Press.
- Browne, A. L., & Bishop, B. J. (2011). Chasing our tails: Psychological, institutional and societal paradoxes in natural resource management, sustainability, and climate change in Australia. *American Journal of Community Psychology*, 47 (3-4), 354-361.
- Castro, P., & Mouro, C. (2011). Psycho-Social processes in dealing with legal innovation in the community: Insights from biodiversity conservation. *American Journal of Community Psychology*, 47 (3-4), 362-373.
- Culley, M. R., & Angelique, H. (2011). Participation, power, and the role of community psychology in environmental disputes: A tale of two nuclear cities. *American Journal of*

Community Psychology, 47 (3-4), 410-426.

Culley, M. R., & Hughey, J. (2008). Power and public participation in a hazardous waste dispute: A community case study. *American Journal of Community Psychology*, 41(1), 99-114.

Dean, J. H., & Bush, R. A. (2007). A community psychology view of environmental organization processes. *American Journal of Community Psychology*, 40(1), 146-166.

Department of Environmental Conservation. (2011). Emerald Ash Borer Awareness Week: May 22-28, 2011. Retrieved May 21, 2011 from <http://www.dec.ny.gov/animals/74604.html>

Fraser, E. D., & Kenney, W. A. (2000). Cultural background and landscape history as factors affecting perceptions of the urban forest. *Journal of Arboriculture*, 26(2), 106-113.

Frumkin, H. (2001). Beyond toxicity: Human health and the natural environment. *American Journal of Preventive Medicine*, 20(3), 234-240.

Gifford, R. (1997). *Environmental psychology: Principles and practice*. Needham Heights, MA: Allyn and Bacon.

Grese, R.E., Kaplan, R., Ryan, R.L., & Buxton, J. (2000). Psychological benefits of volunteering in stewardship programs. In P.H. Gobster & R. Hull (Eds.), *Restoring nature: Perspectives from the social sciences and humanities*. (pp. 265-80). Washington, DC: Island Press.

Hawe, P., Shiell, A., & Riley, T. (2009). Theorizing interventions as events in systems. *American Journal of Community Psychology*, 43(3), 267-276.

Johnson, J.R., Johnson, G.R., McDonough, M.H., Burban, L.L., & Monear, J.K. (2010). *Tree owner's manual*. [Pamphlet] United States Department of Agriculture, Forest Service, Northeastern Area State and Private Forestry. Retrieved from www.treeownersmanual.info

Jones, O., & Cloke, P. (2002). *Tree cultures. The place of trees and trees in their place*. Oxford, United Kingdom: Berg.

Kaplan, R. & S. Kaplan. (1989). *The experience of nature: A psychological perspective*. New

York: Cambridge University Press.

- Kaplan, R. (2001). The nature of the view from home: Psychological benefits. *Environment and Behavior*, 33(4), 507-542.
- Kaplan, R. (2007). Employees' reactions to nearby nature at their workplace: The wild and the tame. *Landscape and Urban Planning*, 82(1-2), 17-24.
- Kaplan, S., & Kaplan, R. (2009). Creating a larger role for environmental psychology: The reasonable person model as an integrative framework. *Journal of Environmental Psychology*, 29(3), 329-339.
- Kelly, J. G. (1966). Ecological constraints on mental health services. *American Psychologist*, 21(6), 535-539.
- Kelly, J. G., Ryan, A. M., Altman, B. E., & Stelzner, S. P. (2000). Understanding and changing social systems: An ecological view. In Rappaport & Seidman (Eds.), *Handbook of community psychology*. (pp. 133-59). New York, New York: Kluwer Academic/Plenum.
- Kuo, F. E., Sullivan, W. C., Coley, R. L., & Brunson, L. (1998). Fertile ground for community: Inner-city neighborhood common spaces. *American Journal of Community Psychology*, 26(6), 823-851.
- Kuo, F. E., & Sullivan, W. C. (2001). Aggression and violence in the inner city: Effects of environment via mental fatigue. *Environment and Behavior*, 33(4), 543-571.
- Larson, L., Whiting, J., & Green, G. (2011). Exploring the influence of outdoor recreation participation on pro-environmental behavior in a demographically diverse population. *Local Environment*, 16(1), 67-86.
- Levine, M., Perkins, D. D., & Perkins, D. V. (2005). *Principles of community psychology: Perspectives and applications* (3 ed.). New York: Oxford University Press.
- Liu, J., Dietz, T., Carpenter, S. R., Alberti, M., Folke, C., Moran, E., Lubchenco, J., Ostrom, E., Ouyang, Z., Provenchur, W., Redman, C. L., Schneider, S. H., & Taylor, W. W. (2007). Complexity of coupled human and natural systems. *Science*, 317(5844), 1513-1516.

- Lohr, V. I., Pearson-Mims, C. H., Tarnai, J., & Dillman, D. A. (2004). How urban residents rate and rank the benefits and problems associated with trees in cities. *Journal of Arboriculture*, 30(1), 28-35.
- Lounsbury, D. W., & Mitchell, S. G. (2009). Introduction to special issue on social ecological approaches to community health research and action. *American Journal of Community Psychology*, 44(3), 213-220.
- Lu, J. W. T., Svendsen, E. S., Campbell, L. K., Greenfeld, J., Braden, J., King, K. L., & Falxa-Raymond, N. (2010). Biological, social and urban design factors affecting youth street tree mortality in New York City. *Cities and the Environment*, 3(1): Article 5.
- Marzluff, J. M. (2008). *Urban ecology: An international perspective on the interaction between humans and nature*. New York: Springer.
- McLaren, L. & Hawe, P. (2005). Ecological perspectives in health research. *Journal of Epidemiology and Community Health*, 59, 6-14.
- McPherson, E. G., & Ferrini, F. (2010). Trees are good, but... *Arborist News*, 19(5), 58-60.
- McPherson, E. G. (2006). Urban forestry in North America. *Renewable Resources Journal*, 24(3), 8-12.
- Miles, I., Sullivan, W. C., & Kuo, F. E. (1998). Ecological restoration volunteers: The benefits of participation. *Urban Ecosystems*, 2(1), 27-41.
- Moskell, C., Broussard Allred, S., & G. Ferenz. (2010). Examining motivations and recruitment strategies for urban forestry volunteers. *Cities and the Environment*, 3(1): Article 9.
- Mullins, & Fargo. (2008). *Protecting and developing the urban tree canopy: A 135-city survey*. United States Conference of Mayors.
<http://www.usmayors.org/trees/treefinalreport2008.pdf>
- Nowak, D. J., Crane, D. E., & Stevens, J. C. (2006). Air pollution removal by urban trees and shrubs in the United States. *Urban Forestry & Urban Greening*, 4(2006), 115-123.
- Nowak, D. J., Wang, J., & Endreny, T. (2007). Environmental and economic benefits of

- preserving forests within urban areas: Air and water quality. In de Brun (Ed.), *The economic benefits of land conservation*. (pp. 28-47). Trust for Public Land.
- Okvat, H. A., & Zautra, A. J. (2011). Community gardening: A parsimonious path to individual, community, and environmental resilience. *American Journal of Community Psychology*, 47, (3-4), 374-387.
- Ostrom, E. (2009). A general framework for analyzing sustainability of social-ecological systems. *Science*, 325(5939), 419-422.
- Phalen, K. B. (2009). An invitation for public participation in ecological restoration: The Reasonable Person Model. *Ecological Restoration*, 27(2).
- Pillemer, K., Fuller-Rowell, T. E., Reid, M. C., & Wells, N. M. (2010). Environmental volunteering and health outcomes over a 20-year period. *The Gerontologist*, 1-9.
- Pincetl, S. (2010a). From the sanitary city to the sustainable city: Challenges to institutionalizing biogenic (nature's services) infrastructure. *Local Environment*, 15(1), 43-58.
- Pincetl, S. (2010b). Implementing municipal tree planting: Los Angeles million-tree initiative. *Environmental Management*, 45(2), 227-238.
- Poland, T. M., & McCullough, D. G. (2006). Emerald ash borer: Invasion of the urban forest and the threat to North America's ash resource. *Journal of Forestry*, 104(3), 118-124.
- Quimby, C. C., & Angelique, H. (2011). Identifying barriers and catalysts to fostering pro-environmental behavior: Opportunities and challenges for community psychology. *American Journal of Community Psychology*, 47, (3-4), 388-396
- Rae, R. A., Simon, G., & Braden, J. (2010). Public reactions to new street tree planting. *Cities and the Environment*, 3(1): Article 10.
- Rich, R. C., Edelstein, M., Hallman, W. K., & Wandersman, A. H. (1995). Citizen participation and empowerment: The case of local environmental hazards. *American Journal of Community Psychology*, 23(5), 657-676.
- Riemer, M. (2010). Community psychology, the natural environment and global climate change.

- In G. Nelson & I. Prilleltensky (Eds.), *Community psychology: In pursuit of liberation and well-being* (2 ed.). New York, NY: Palgrave MacMillan.
- Riemer, M., & Reich, S. M. (2011). Community psychology and global climate change: Introduction to the special section. *American Journal of Community Psychology*, 47, (3-4), 349-353.
- Ryan, R. L., Kaplan, R., & Grese, R. E. (2001). Predicting volunteer commitment in environmental stewardship programs. *Journal of Environmental Planning and Management*, 44(5), 629-648.
- Sallis, J. F., & Owen, N. (2002). Ecological models of health behavior. In K. Glanz, B. K. Rimer, & F. M. Lewis (Eds.), *Health behavior and health education: Theory, research and practice* (3 ed.). San Francisco, CA: John Wiley & Sons Inc.
- Sallis, J. F., Cervero, R. B., Ascher, W., Henderson, K. A., Kraft, M. K., & Kerr, J. (2006). An ecological approach to creating active living communities. *Annual Review of Public Health*, 27(1), 297-322.
- Schensul, J. J., & Trickett, E. (2009). Introduction to multi-level community based culturally situated interventions. *American Journal of Community Psychology*, 43(3), 232-240.
- Schwab, J.C. (2009). *Planning Advisory Service, Report Number 555: Planning the urban forest: Ecology, economy, and community development*. Chicago, IL: American Planning Association.
- Sirianni, C. & Friedland, L.A. (2001). *Civic innovation in America: Community empowerment, public policy and the movement for civic renewal*. Ewing, NJ: University of California Press.
- Sommer, R., Learey, F., Summit, J., & Tirrell, M. (1994). The social benefits of resident involvement in tree planting. *Journal of Arboriculture*, 20, 170-175.
- Stokols, D., Grzywacz, J., McMahan, S., & Phillips, K. (2003). Increasing the health promotive capacity of human environments. *American Journal of Health Promotion*, 18(1), 4-13.
- Sullivan, W. C., Kuo, F. E., & Depooter, S. F. (2004). The fruit of urban nature: Vital neighborhood spaces. *Environment and Behavior*, 36(5), 678-700.

- Svendsen, E. S., & Campbell, L. K. (2008). Urban ecological stewardship: Understanding the structure, function and network of community-based urban land management. *Cities and the Environment*, 1(1): Article 1.
- Taylor, A. F., Kuo, F. E., & Sullivan, W. C. (2001). Views of nature and self-discipline: Evidence from inner city children. *Journal of Environmental Psychology*, 22(1-2), 49-63.
- Tennessen, C. M., & Cimprich, B. (1995). Views to nature: Effects on attention. *Journal of Environmental Psychology*, 15(1), 77-85.
- Tidball, K. G., Krasny, M., Svendsen, E., Campbell, L., & Helphand, K. (2010). Stewardship, learning, and memory in disaster resilience. *Environmental Education Research*, 16(5-6), 591-609.
- Trickett, E. J. (2009). Multilevel community-based culturally situated interventions and community impact: An ecological perspective. *American Journal of Community Psychology*, 43(3), 257-266.
- Voorhees, C. (2009). Measuring ecological validity: A theory-based assessment of ecological validity in community psychology research. (Unpublished Masters thesis). Vanderbilt University, Nashville, Tennessee.
- Wells, N. M. (2000). At home with nature: Effects of "greenness" on children's cognitive functioning. *Environment and Behavior*, 32(6), 775-795.
- Wells, N. M., & Evans, G.W. (2003). Nearby nature: A buffer of life stress among rural children. *Environment and Behavior*, 35(3), 311-330.
- Wells, N.M., W. Evans, and Y. Yang. 2010. Environments and health: Planning decisions as public health decisions. *Journal of Architectural Research and Planning* 27:124-143.
- Wells, N. M., & Lekies, K.S. (2006). Nature and the life course: Pathways from childhood nature experiences to adult environmentalism. *Children, Youth and Environments*, 16(1), 1-24.
- Westphal, L. M. (2003). Urban greening and social benefits: A study of empowerment outcomes. *Journal of Arboriculture*, 29(3), 137-147.

- Wolf, K. L., Blahna, D. J., Brinkley, W., & Romolini, M. (2011). Environmental stewardship footprint research: Linking human agency and ecosystem health in the Puget Sound region. *Urban Ecosystems*, 1-20. Advance online publication. doi:10.1007/s11252-011-0175-6
- Young, R. F. (2011). Planting the living city. *Journal of the American Planning Association*, 77(4), 368-381.
- Zhang, Y., Hussain, A., Deng, J., & Letson, N. (2007). Public attitudes toward urban trees and supporting urban tree programs. *Environment and Behavior*, 39(6), 797-814.

CHAPTER FIVE: DISCUSSION

In this chapter, I summarize the methods and results from each study and discuss the relationships between the findings. Next, I explore and compare key findings from each study and propose directions for future research. Limitations to each study are also discussed.

Summary of Methods

In Chapter 2, I used qualitative research methodology to conduct semi-structured interviews with urban forestry practitioners and I analyzed interview transcripts using a grounded theory approach. In Chapter 3, I used quantitative research methodology to conduct an on-site survey of residents and used statistical analyses (cross-tabulations, chi-square tests, binary logistic regressions) to measure relationships between variables. In Chapter 4, I conducted an extensive literature review of ecological models of behavior used in community psychology and health behavior fields and applied the theory behind these models to the context of urban forest stewardship and developed an ecological model. Together, these chapters point to elements at the community, macro-policy and organizational levels of analysis that influence stakeholder engagement in urban forest management activities.

Discussion of Key Findings

Findings from Chapter 2 provided insight into four approaches to stakeholder engagement in urban forestry: stakeholder analysis, communication, education and empowerment. Personal, face-to-face interactions with stakeholders were commonly used during stakeholder analysis and communication. Tree planting programs served as vehicles for educating stakeholders about urban forestry and for empowering participants to become actively

engaged in tree planting and stewardship activities in their neighborhoods. A major finding was that urban forestry practitioners primarily engage stakeholders that are already interested in urban forestry, and who are motivated to become involved in tree planting and stewardship activities in their community. Many practitioners reported that these stakeholders identify themselves to their organization, which sometimes precludes practitioners conducting instrumental stakeholder analysis among these self-identified stakeholder audiences.

Practitioners also described the types of advanced trainings for individuals or small groups of residents who are interested in planting trees in their neighborhood. The structure of these programs seem to be empowering for the participants in that they gain community organizing and leadership skills to effect positive behavior change for urban forest stewardship and tree planting in their community. Although practitioners seem to be working most closely with these self-identified or self-motivated stakeholders. These audiences are the “low-hanging fruit,” an idiom that was used by more than one practitioner to explain their tendency to engage people who are already interested in trees, or who have the space on their property or in their neighborhood to plant trees. More than one practitioner discussed how engaging new audiences is challenging. Several interviewees described the characteristics of these hard to reach (“high-hanging fruit”) audiences, which included non-English speaking populations, non-property owning residents, low-income populations and people who do not like trees.

Chapter 2 contributes to the literature on stakeholder engagement in urban forestry by shedding light on the implementation of the stakeholder engagement methods described in the literature. For example, the interviews highlight the importance of personally interacting with stakeholders, such with community leaders during the stakeholder analysis process, with residents that are canvassed before trees are planted, or with other community

members who are observed to be harming trees. The urban forestry literature on stakeholder engagement, primarily instrumental stakeholder analysis, overlooks how the personal interactions that occur as the practitioner is gathering information on stakeholders can be used to build a network of personal relationships based on trust and respect. Chapter 2 also reveals the difficulties that practitioners encounter as they try to engage new audiences and expand their programs to areas of their community that have not previously been successfully engaged in urban forestry.

In chapter 2, I found that residents primarily endorse a government-centered approach to urban forest stewardship as opposed to one that involves civil society or a partnership between government, civil society and other stakeholders. I also found that educational interest and previous involvement were negatively related to government interest, but were predictive of the belief that urban forest governance is a shared responsibility. This suggests that the more involvement in urban forestry a person has, the more likely they are to believe that responsibility for urban forest management should be shared with actors outside of government. The desire to learn about urban forestry might suggest future behavioral intentions related to stewardship. However, this study did not measure their intention for learning more about trees, and whether they wanted to learn about something positive (e.g. the benefits of trees, how to take care of trees) or if they wanted to learn something negative (e.g. how to remove a tree). Nonetheless, the survey respondents who expressed an educational interest, who had previous involvement in urban tree care and who had the belief that urban forest management is a civil society or shared responsibility, may be members of the “low-hanging fruit” stakeholder audience described by interviewees in Chapter 1 because they recognize that civil society and other stakeholders can play a role in urban forest management.

The survey of residents in Chapter 2 revealed that people hold different beliefs toward urban forest governance for trees planted along streets and in parks, as well as different attitudes toward the benefits provided by and problems caused by trees. Trees planted in parks were associated more frequently with ecological services whereas people tended to report neighborhood improvement and human health benefits of street trees. Survey respondents also reported multiple problems caused by trees. In Jamaica, people who believed that street trees cause problems were 1.5 times as likely to believe that government should be responsible for taking care of trees. Several of the urban forestry practitioners in Chapter 2 commented about how problems caused by trees make it difficult for them to communicate about the benefits provided by trees. Urban forestry practitioners noted that it is difficult to persuade people who have had negative experiences with trees that trees provide benefits at all. Attitudes toward tree benefits and tree problems are not mutually exclusive, but believing that the problems outweigh the benefits may lead some people to believe that trees (and the problems they cause) are not their responsibility. Fostering positive attitudes toward trees is challenging for practitioners, but this change in attitudes will be necessary for motivating people to care for trees in their community.

In Chapter 3, I argue that efforts to engage residents in stewardship need to account for the built and social environment surrounding where the trees are planted. Urban trees are part of complex socio-ecological systems and are planted within the built infrastructure and social fabric of cities. These environments influence the health of trees and the urban forest. Lu et al. (2010) found that street trees in NYC neighborhoods with single or two-family homes and low levels of automobile traffic had lower mortality rate (than those planted in high-traffic areas with rental units)s. The authors also found that trees that exhibited evidence of stewardship had a

significantly lower mortality rate than did trees without evidence of stewardship. However, we still do not understand the mediating factors, such as an active neighborhood tree care group, in the built and social environment that influences people's willingness and ability to engage in the types of stewardship behaviors that reduce urban tree mortality. Chapter 3 suggests that the context of where trees are planted influence people's attitudes toward trees and their beliefs about who should be responsible for tree maintenance in that setting. As shown in the proposed ecological model of stewardship behavior, these attitudes and beliefs may be shaped by factors in other environments that are also present in the settings where trees are planted, such as by civic organization activities, the socio-cultural beliefs, values and norms in the community and the macro-level policies that regulate behavior in that setting. Future efforts to engage stakeholders in urban tree planting and stewardship should consider how these multiple environmental factors interact to encourage or hinder stewardship behavior.

Implications and Tensions for Urban Forest Management

Large-scale 'million-tree' programs, such as MTNYC, need to more directly and meaningfully engage residents and property owners in the decision to plant trees in their communities. In an urban forestry context, it is important that residents are able to articulate and assert their relationship with the natural and social environment in their communities to planning authorities and policy makers (Butterworth and Fisher 2000). Participating in the urban forest planning process can be the vehicle through which stakeholders acquire skills for civic engagement beyond issues in urban forestry, but residents must first learn how to participate effectively in democratic decision-making processes (Van der Veen 2003), especially in neighborhoods where people lack the skills and resources for effective democratic participation

in local government (Van der Veen 2003; Butterworth and Fisher 2000). Disadvantaged urban populations are especially in need of action-oriented education that teaches them how to form proactive groups that desire to address local issues of concern, raise consciousness about those issues and seek out the most effective political avenues for solving those issues (Butterworth and Fisher 2000). Ultimately, the acquisition of these skills (negotiation, communication, and networking) within a grassroots group of citizens is critical to adult learning (Van der Veen 2003) and action-competence (Short 2010). These negotiation and communication skills can begin to develop, literally on people's doorsteps, if only residents were first involved in the decision to have trees planted by the city.

By planting trees without the direct involvement of residents and property owners, large-scale urban tree planting programs may be missing opportunities for fostering a sense of ownership and investment in the residents who are needed to care for the trees in the future. If people are not involved in the planting activities, they may not view themselves as responsible for taking care of the trees. Even though cities have the legal authority to plant trees on public properties, such as in street medians and along sidewalks, many residents feel that this land is their personal territory. Rae et al. (2010) found that many residents complained about trees that were planted by the city in front of their property. The authors attributed these complaints to ineffective stakeholder engagement and suggest that residents need to be more involved in the planting process. However, they acknowledge that stakeholder engagement campaigns conducted on a large scale would be difficult to manage. Urban forestry practitioners have echoed these concerns in this study and in others (Johnston and Shimada 2004; Moskell et al. 2010).

The urban forestry practitioners interviewed as part of this study attest to the importance

of involving the community as much as possible in tree planting activities. These results point to approaches that could potentially be used to engage stakeholders in tree planting decisions on a wide scale. Many practitioners reported that they utilize volunteers to canvass neighborhoods before tree planting occurs. Canvassing entails volunteers speaking face-to-face with a homeowner or property owner to personally ask them if they would like to receive a tree or have a tree planted. This is most effective when the canvassers are actually community residents. Canvassing may serve a few purposes. First, as one practitioner noted, even though this interaction between volunteers and property owners may last only a few minutes, it begins to get the property owner thinking about trees. Even if they say no, they may be more aware of trees when they are walking around in their neighborhood or when they overhear other people talking about trees. Second, canvassing can help to inform the community about tree planting activities in the neighborhood and can provide residents with information about tree care, how to deal with the legal issues that arise when trees cause property damages, and other ways that interested residents could get involved with tree care.

Third, giving residents the option to have a tree planted may demonstrate respect for their semi-private territory and at least involve them in the decision to have a tree planted. Fourth, trained volunteers from the community may be more effective at convincing their neighbors to have a tree planted than urban forestry practitioners, and so it matters that volunteers from the neighborhood are conducting the canvassing. Several interviewees emphasized that volunteers can be advocates and champions for trees in their neighborhood and that they know best how to get their neighbors involved in tree planting. Canvassing efforts could be supported if large-scale tree planting programs devoted more funding to stakeholder engagement and outreach initiatives.

Canvassing residents prior to planting trees would naturally pose new challenges in the

context of a large scale ‘million-tree’ planting program. Asking residents and property owners if they would like to have a tree planted outside of their home would significantly slow down progress toward ‘million-tree’ goals. This may have serious political implications for the Mayoral administrations who implemented these programs if they are unable to reach the ‘million-tree’ goal as quickly as initially promised. Furthermore, giving residents and property owners the option to have trees planted may lead us to the “low hanging fruit” problem described by the interviewees in this study in that the people who will say yes to the trees will be the people who like trees, and who have the knowledge and the resources to take care of the trees. The “low-hanging fruit” problem may further perpetuate disparities in the urban tree canopy cover, which these million-tree planting programs aim to address.

Many ‘million-tree’ programs, including New York City, are prioritizing tree-planting activities in neighborhoods that have low-urban tree canopy cover. Extensive amounts of research using GIS, public health, crime and demographic data has informed the decision by MTNYC (Grove et al. 2006; Locke et al. 2010) and other ‘million-tree’ programs (e.g. McPherson et al. 2010) to plant trees in low urban tree canopy neighborhoods. Using this data, researchers have determined that the benefits provided by trees can be maximized if they are planted in these neighborhoods. However, this approach to urban forest planning may overlook these community’s local knowledge of the economic, social and health issues in the community. Such has been the case with other large-scale urban planning schemes. Scott (1998) examined how urban and agricultural planners failed to recognize *mētis*, defined as “knowledge that can come only through practical experience” (p. 6) in their attempt to make the social order more simplified and legible for carrying out actions of the state. For example, the city of Brasilia (the capital of Brazil) was designed based on high-modernist urban design that emphasized the

efficient and rational organization of cities, achieved through the spatial segregation of housing, recreation, traffic and public administration. After the city was built, planners recognized that the built design of the city diminished the spaces for social interactions and community life, which in turn eroded the local culture and character of the city. Scott (1998) argues that top-down planning schemes are destined to fail if they overlook *mētis*.

A coupled approach to urban forest planning that integrates science-based knowledge and local knowledge is needed to avoid the outcomes that Scott (1998) described in Brazil. Such an approach could better ensure that multiple perspectives are integrated into the urban forestry planning process so that newly planted trees are culturally situated in the areas where they are planted. The integration of GIS data and ground level knowledge of the social activities and cultural values that exist raises a tension between “experts” and “citizens.” Fisher (1998) examines the tensions that arise between citizens’ local knowledge and the technically rational knowledge of “expert” scientists in the context of environmental decision-making processes. He argues that policy makers have failed to integrate local and expert knowledge, in part because of the perception that citizens do not have enough knowledge to intelligently deliberate about complex and technical policy issues compared to scientist experts.

Some of the practitioners in Chapter 2 alluded to the tension raised by Fisher (1998) in that they reported that people’s negative attitudes toward trees, and their perceptions that trees cause problems, was problematic for effective communication and stakeholder engagement. The interviewees in Chapter 2 were well versed in the research on the numerous environmental, community and health benefits that trees provide and many of them confessed that they were “tree lovers.” For that reason, many of the interviewees described how hard it was for them to understand that there are people who do not like trees and who do not believe that trees provide

benefits. Many of the New York City residents that I surveyed in Chapter 3 also shared their attitudes toward trees and the problems they cause. This disconnect between “experts” (practitioners) and citizens attitudes toward trees points to the different mental models with which people view the urban forest. Attitudes toward trees are based in part on previous experiences with trees. Whereas urban forestry practitioners recognize the benefits of trees, some residents may only recognize the problems caused by trees because they may have experienced the financial burden associated with fixing tree-related property damages, that for them, outweighed the benefits the trees provide.

The Reasonable Person Model (Kaplan and Kaplan 2009) presented as part of the ecological model of stewardship in Chapter 3 offers insight into the role of model building within stakeholder engagement in urban forestry. Practitioners and citizens often have different mental models of urban trees and forests that are based on their own previous experiences with trees. Efforts to better understand how residents view and perceive urban trees —“where people are at” in their understanding of urban forestry concepts in the words of Interviewee #12—may help practitioners to better craft messages that resonate with residents, and that engage them in a more meaningful way than messages that include scientific jargon, for example. Additionally, paying attention to the reasons why people do not like trees can potentially highlight people’s local knowledge and experiences about the problems that trees cause in their community, which may then better enable practitioners to address those issues.

Personal Reflection

Before concluding this thesis, I believe it is necessary to acknowledge the *mētis* that I gained during the data collection process. Although it occurred outside of the confines of my

research methods, the *mētis* I gained when I conducted my thesis research, and when I lived and worked in New York City as a program and research assistant with Cornell Cooperative Extension-NYC in 2010, greatly enhanced my analysis and understanding of the complexity of the issues I was researching.

My observations of the street trees that I passed by every day in the Brooklyn neighborhood where I lived shaped the development of the ecological model presented in Chapter 4. There was a row of newly planted trees (with MTNYC tree tags) outside of a tall apartment building that I walked by on my way to the subway. Over the course of the summer, their leaves turned brown and dry because they needed water. In looking at those trees, and then looking up at the apartment building, I realized that many residents in the building may not have the ability (or the desire) to carry water from their apartment down to the sidewalk to water the trees. In exploring different parts of the neighborhood and visiting other parts of the city throughout the summer, I often envisioned myself as a resident in that neighborhood and imagined what it would be like to take care of the trees on those streets. There were certainly some places where I perceived that it wouldn't look strange to water the trees or to garden the planting beds around the trees, perhaps because there were other signs of these activities in the same neighborhood. Living and working in New York City helped me to see how urban design may pose barriers for stewardship behaviors, but also how the local culture and life of city streets may also encourage people to engage in stewardship. These experiences catalyzed theoretical exploration into the ways that built and social elements in the community could be altered or enhances to encourage community members to care for trees.

In conducting the survey of residents presented in Chapter 3, I was surprised to learn a great deal about people's attitudes toward trees from many people who declined to take my

survey, but who made comments about trees as they walked by. One of the most memorable comments I received was from a man in Jamaica who told me that I should plant mango and pineapple trees in the city. I thought his comment was outrageous because mango trees can't grow in New York City. But, a few days later, I saw street vendors selling sliced mangoes and papayas. Then, I realized that that man's comment wasn't ridiculous after all and that it was a reflection of the culture of the neighborhood. Perhaps planting fruit trees that are suitable for New York City's climate and that have cultural value to the local community is part of the solution for engaging new audiences in urban forestry.

My surveying experiences also demonstrated the potential that canvassing and face-to-face personal conversations may have for encouraging residents to plant and care for trees. I must have approached close to 1,000 people and asked them if they wanted to participate in the survey. Even though the majority of those people declined to take my survey, I now realize that my request to them to take the survey may have caused them to at least think about trees for a few seconds more than they probably would have otherwise that day. This sentiment had been mentioned by one of the practitioners I interviewed in chapter 2.

Future Research

This thesis serves as a foundation for many interesting avenues of future research. Chapter 2 expands upon the work of Westphal (2003) and her examination of the empowerment outcomes of urban forestry programs for individuals. Future research should further examine the characteristics of empowering structures and processes within urban forestry organizations that were revealed in the interviews with urban forestry practitioners. These included the core activities of volunteer community organizing training programs and the relationship environment

among participants. Such a research study could potentially then inform the design of neighborhood tree planting programs and ways of integrating these empowering processes into other urban forestry programs.

The findings of chapter 3 raise important questions about the implications of assumed citizen responsibility for urban tree maintenance in shared environmental governance. The recent study by Rae et al. (2010) about citizens' complaints about urban tree planting activities suggests that a better process is needed for involving residents in tree planting decisions so that they develop a sense of ownership and responsibility for taking care of urban trees. Social psychological research on procedural justice theory may provide a theoretical foundation for future research on how to engage stakeholders in urban tree planting decisions. Procedural justice theory holds that the manner in which public participation procedures are conducted can influence the public's reaction and satisfaction to the resulting decision that is made. In other words, the process through which a decision is made can be equally, if not more, important in shaping public satisfaction of the decision-making outcome than the final outcome itself (Lawrence and Daniels 1997). Applying this theory to the context of urban tree planting programs could shed light on how different levels of citizen participation in tree planting decision influences residents' satisfaction with the trees, and their willingness to engage in stewardship actions of those trees. A study using a quasi-experimental design could be used to measure satisfaction with trees between residents who were and who were not asked for permission before trees were planted. Alternatively, a case study design could be used to compare the citizen participation processes within different 'million-tree' programs that are currently underway in cities across the United States.

As demonstrated in Chapter 3, the policy-environment and legal issues surrounding urban

trees, as well as the diverse network of actors involved in urban environmental stewardship on public lands, may not effectively facilitate citizen's understanding of their role within urban forest governance. The Reasonable Person Model (Kaplan and Kaplan 2009) introduced in Chapter 3 may also provide a theoretical foundation for further examination of how environments can be altered to foster citizens' meaningful action (and model building and effectiveness) in urban greening efforts in their community. R. Kaplan et al. (2011) and S. Kaplan et al. (2011) identified a need for the operationalization of the components of the model. Future research can apply this model to develop indicators of model building, meaningful action and effectiveness in the context of urban forest management. Given the disparity that exists between low-income and affluent neighborhoods in terms of urban forest canopy cover, perhaps the Reasonable Person Model could be further tested in "high-hanging fruit" neighborhoods where the barriers to model building, meaningful action and effectiveness in urban forest management are perhaps most evident.

Future research could test the proposed ecological model of stewardship behavior presented in Chapter 3. This would require the operationalization of the hypothesized components included in the model (Natasi and Hitchcock 2009). Since the model is so complex, research could operationalize the variables in just a portion of the model, such as the neighborhood environment. For example, an inventory of the social (presence of local tree care groups) and physical structures (ground level access to water) available within behavior settings for street tree stewardship could be conducted. The policy environment within these settings could also be analyzed to measure the degree of citizen participation in the tree planting process. An example of a "low" participation setting would be one in which residents are not consulted before trees are planted whereas "high" participation settings may entail requiring property

owners to sign a permission slip for the city to plant trees adjacent to their property, or otherwise involve them in the decision-making process prior to planting. These inventories could then inform the design of a multi-level ecological intervention that introduces changes within the settings (e.g. increased citizen participation in tree planting, provision of physical tools for stewardship). A quasi-experimental design could be used to randomly assign participants to a treatment group where the intervention is implemented, and to a control group that does not receive the intervention. Statistical analyses could be conducted to measure the effect of the intervention on stewardship behavior. Future research along these lines could also include a qualitative component in order to explore the activities, norms, values and the local knowledge that exists within the areas where trees are planted. This qualitative research could then be used to ensure that the multi-level intervention is community based and culturally situated (Trickett 2009).

Conclusion

As cities continue planting trees in the future, engaging stakeholders in the planning, planting and maintenance of the trees will be critical for ensuring that residents are satisfied with the trees and are willing and able to provide basic care to the trees. Stakeholder engagement may help residents and property owners to recognize that they play an important role in shared urban forest governance, that is to assist urban forest managers and practitioners in the government and civil society sector to help maintain newly planted trees. Urban forestry practitioners play an important role in engaging residents in tree planting and stewardship activities, and the results of this research suggests that practitioners employ effective engagement methods for reaching individuals who are motivated to actively participate in and lead urban forestry activities in their

community. Urban forestry practitioners and their organizations are able to empower these participants to become advocates for urban forestry issues in their community and to recruit their neighbors to also become involved in tree planting activities. However, there are also other stakeholder audiences that urban forestry practitioners struggle to engage, including low-income, non-English speaking communities. As ‘million-tree’ programs in New York City and elsewhere progress toward their tree planting goals, the meaningful participation of residents in these hard to reach communities will be critical for achieving sustainable urban forest governance.

REFERENCES

- Butterworth, I.M and A.T. Fisher. 2000. Urban environmental education: A community psychology perspective. In *Environment-Behavior Research on the Pacific Rim: Proceedings of the 11Th International Conference on People and Physical Environment Research*.
- Fischer, F. 2000. *Citizens, Experts and the Environment: The Politics of Local Knowledge*. Durham, NC: Taylor & Francis.
- Grove, J.M., J. O'Neil-Dunne, K. Pelletier, D. Nowak, and J. Walton. 2006. A report on New York City's present and possible urban tree canopy. South Burlington, VT: US Department of Agriculture, Forest Service, Northeastern Research Station
- Johnston, M. and L.D. Shimada. 2004. Urban forestry in a multicultural society. *Journal of Arboriculture* 30 (3): 185-192.
- Kaplan, R., R. Grese, R. Ginsburg, and N. Wells. 2011. Bringing out the best in people: Applying the Reasonable Person Model (RPM) in Educational Settings. *Conference Proceedings of the 42nd Annual Environmental Design Research Association National Conference*.
- Kaplan, S., G. Bradley, W. Sullivan, R. Ryan, and L. Westphal. 2011b. Bringing out the best in people: Can urban greening help? *Conference Proceedings of the 42nd Annual Environmental Design Research Association National Conference*.
- Kaplan, S. and R. Kaplan. 2009. Creating a larger role for environmental psychology: The reasonable person model as an integrative framework. *Journal of Environmental Psychology* 29 (3): 329-339.
- Lawrence, R.L., S.E. Daniels, and G.H. Stankey. 1997. Procedural justice and public involvement in natural resource decision-making. *Society & Natural Resources* 10 (6): 577-589.
- Locke, D.H., J. M Grove, J.W.T. Wu, A. Troy, J.P.M O'Neil-Dunne, and B.D. Beck. 2010. Prioritizing preferable locating for increasing urban tree canopy in New York City. *Cities and the Environment* 3 (1): Article 4.

- Lu, J. W.T., E.S. Svendsen, L.K. Campbell, J. Greenfeld, J. Braden, K L. King, and N. Falxa-Raymond. 2010. Biological, social and urban design factors affecting youth street tree mortality in New York City. *Cities and the Environment* 3 (1): Article 1.
- McPherson, E.G., J.R. Simpson, Q. Xiao, and C. Wu. 2008. Los Angeles 1-Million tree Canopy Cover Assessment. United States Department of Agriculture, Forest Service, Pacific Southwest Research Station. General Technical Report PSW-GTR-207.
- Moskell, C., S. Broussard Allred, and G. Ferenz. 2010. Examining motivations and recruitment strategies for urban forestry volunteers. *Cities and the Environment* 3 (1): Article 9.
- Nastasi, B.K. and J. Hitchcock. 2009. Challenges of evaluating multilevel interventions. *American Journal of Community Psychology* 43 (3): 360-376.
- Rae, R.A., G. Simon, and J. Braden. 2010. Public reactions to new street tree planting. *Cities and the Environment* 3 (1): Article 10.
- Scott, J.C. 1998. *Seeing Like a State: How Certain Schemes to Improve the Human Condition Have Failed*. New Haven, CT: Yale University Press.
- Short, P.C., 2010. Responsible environmental action: Its role and status in environmental education and environmental quality. *The Journal of Environmental Education* 41 (1): 7-21.
- Trickett, E.J. 2009. Multilevel community-based culturally situated interventions and community impact: An ecological perspective. *American Journal of Community Psychology* 43 (3): 257-266.
- Van Der Veen, R. 2003. Community development as citizen education. *International Journal of Lifelong Education* 22 (6): 580-596.
- Westphal, L.M. 2003. Urban greening and social benefits: A study of empowerment outcomes. *Journal of Arboriculture* 29 (3): 137-147.

APPENDICES

Appendix A: Interview Guide with Urban Forestry Practitioners

Program history and overview

1. Could you give me a short description of the organization that you lead/work for, and what your job responsibilities are?
2. What neighborhoods/communities/regions do you work in?
3. What types of activities or programs do you oversee?
4. Who are the stakeholders or people that your program/work activities target?

Connecting with audiences

5. How do you engage or connect with those audiences?
6. Are the engagements strategies you use dependent on the audience you are targeting? How? Why or why not?

Competition with other issues

7. What other important issues of concern exist in those neighborhoods/communities/regions in which you work?
8. How, if at all, does stewardship fit into these issues, or in efforts or programs to address these issues?
9. Since there are other issues of concern in these neighborhoods/communities/regions, how do you convey the importance of urban forestry in light of those other issues?

Building capacity for stewardship

10. How does your program/organization work to enable or empower people in those neighborhoods/communities/regions to be stewards of urban trees or other natural resources?
11. What has strategies for engaging the stakeholders of your program have been most successful?

Program Success

12. How do you define success for your program?
13. How do you evaluate success for your program?

Challenges for Stewardship

14. What challenges have you encountered related to engagement in natural resource stewardship in the neighborhoods/communities/regions in which you work?
15. In an ideal world, what would enable your organization to overcome these challenges?

Snowball Sampling

16. Whom else would you recommend I speak with about community engagement in urban forestry?

Appendix B: Survey of Residents in Canarsie, Brooklyn and Jamaica, Queens

1. Are you at least 18 years or older?
2. Are you a resident of Canarsie/Jamaica?
 - a. If not, where do you live?
3. Have you recently noticed any newly planted trees in Canarsie Park/in Jamaica?
4. In your opinion, do trees provide benefits in Canarsie Park/in Jamaica?
 - a. If yes, what benefits do they provide?
5. In your opinion, do trees cause problems in Canarsie Park/in Jamaica?
 - a. If yes, what problems do they cause?
6. Who do you think should be responsible for taking care of trees in Canarsie Park/in Jamaica?
7. Have you ever been involved in a group or program to take care of trees?
 - a. If yes, what group or program?
8. Would you be interested in learning more about trees in the future?
9. What is your race or ethnicity?
10. I am going to read out four age ranges. Let me know when I reach yours. Are you 18-24 years old, 25-44 years old, 45-64 years old, or 65 years or older?
11. Gender (via surveyor observation)